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HAF X

OCZ RevoDrive
128GB

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cpu

COMPUTER POWER USER



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RUBY

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Did you find the hidden CPU logo on our cover? Turn the page for the answer.



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EDITOR'S NOTE

Remember back in 2007 when Nvidia unveiled the 8800 GT and shook up the whole graphics card market? It was a blazing-fast little card that you could get for less than half of the cost of the monster cards, and the market (aka video card shoppers like you and me) responded.

Early indications point to another occurrence of this; despite fierce competition from the Red Team for some time now, Nvidia seems to have scored another direct hit with the GeForce GTX 460. You can get one for between \$200 and \$250, depending on factory overlocks, frame buffer size, and so on, and it will run like an absolute champ.

I'd imagine that as with the 8800 GT, this will be a card lots of folks will jump on early, then snap up a second down the road a bit and hitch them to the traces of SLI.

If you're in the market for a graphics refresh (and who among us isn't, from time to time?), do yourself a favor and head to page 20, where our resident ace Andrew Leibman has put together a nice comparo of six brand-name 460s, complete with benchmarks and comparisons to ATI's excellent Radeon HD 5830. Prepare to be impressed.



Chris Trumble, Publication Editor, *CPU*



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We've been noise-canceling headphone wearers for years. With the ability to put the kibosh on crying babies on long flights, street construction outside a bedroom window, and reruns of "House" in the next room, what's not to like? Well, one thing, actually: the headphones need battery power to operate. With Blackbox's i10 Active Noise Cancelling Earphones For iPod, that's not a problem. In lieu of battery juice, the i10s sport a 30-pin dock connector on their 1.3-meter cord (complete with in-line volume controller) for snatching power from a connected iPod/iPhone. Blackbox claims up to 92% ambient noise reduction via "Active Noise Rejection" technology from Phitek Systems. The cans cost roughly \$129 and come with three eartip sizes. ▲



PowerColor Wants To Jack Your Mobo

If the monstrosity that is your graphics card is literally weighing heavy on your rig's motherboard, there's relief available in the form of PowerColor's new PowerJack (about \$15). The expandable jack (61.25mm to 150mm) aims to take pressure off the motherboard by preventing "add-on cards from bending caused by heavy loads." We've yet to witness the PowerJack's strength firsthand, but video and images at the Web site portray a simple but effective screw- and extension rod-based approach similar to the tire jack perhaps residing in your car's trunk. PowerColor says the jack is OK for E-ATX, ATX, and mATX motherboards in full-, mid-, and mini-tower usage. ▲



Apple Gets Chippy

No. 2 in 2011; potentially No. 1 in 2012. That's where iSuppli predicts Apple will rank in terms of the world's biggest semiconductor buyers. iSuppli credits the "phenomenal success of the iPad and iPhone" for propelling Apple past Samsung in 2011 when Apple will spend an estimated \$16.2 billion on chips vs. Samsung's \$13.9 billion and HP's leading \$17.1 billion. iSuppli's Min-Sun Moon equates big semiconductor spending to "a position of prestige," stating Apple's advancement means it's been a success in introducing new products and allocating more dollars to R&D, "two factors that, incidentally, feed innovativeness as well." Elsewhere, Microsoft recently inked a deal with ARM to license its technology and apparently design its own chips (possibly for the Xbox, some predict), something Apple has already done. ▲

Watching The Chips Fall

Here is the pricing information for various AMD and Intel CPUs.

CPU	Released	Original Price	June 2010 Company Pricing	NewEgg.com Retail Price*
AMD Phenom II X6 1090T (Black Edition)	4/27/2010	\$295	\$295	\$295.99
AMD Phenom II X6 1055T	4/27/2010	\$199**	\$199**	\$199.99
AMD Phenom II X4 965 (Black Edition)	8/13/2009	\$245	\$185	\$179.99
AMD Phenom II X4 955 (Black Edition)	4/23/2009	\$245	\$165	\$159.99
AMD Phenom II X4 945	11/4/2009	\$165**	\$145**	\$139.99
AMD Phenom II X4 925	11/4/2009	\$145	\$145	\$135.99
AMD Phenom II X2 555 (Black Edition)	1/25/2010	\$105	\$105	\$100.99
AMD Phenom II X2 550 (Black Edition)	6/2/2010	\$93	\$93	\$87.99
AMD Athlon II X4 Quad-Core 640	5/10/2010	\$122**	\$122**	\$119.99
AMD Athlon II X3 Triple-Core 445	5/10/2010	\$87**	\$87**	\$84.99
AMD Athlon II X3 Triple-Core 440	1/25/2010	\$84	\$76	\$76.99
Intel Core i7-980X Extreme Edition	3/11/2010	\$999**	\$999**	\$999.99
Intel Core i7-975 Extreme Edition	6/2/2009	\$999**	\$999**	\$1,039.99
Intel Core i7-960	10/20/2009	\$562**	\$562**	\$569.99
Intel Core i7-930	Q1 2010	\$294**	\$294**	\$289.99
Intel Core i7-875K	5/28/2010	\$342**	\$342**	\$329.99
Intel Core i5-750	9/8/2009	\$196**	\$196**	\$194.99
Intel Core i5-655K	5/28/2010	\$216**	\$216**	\$209.99
Intel Core i3-550	Q2 2010	\$138**	\$138**	\$149.99
Intel Core i3-540	Q1 2010	\$133	\$133	\$114.99
Intel Core 2 Duo E8600	8/10/2008	\$266**	\$266**	\$289.99

* As of July 2010

** Manufacturer's estimated price per 1,000

HARDWARE MOLE

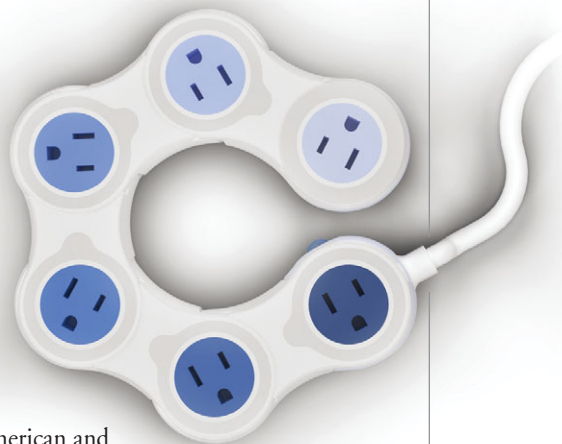
Art Lebedev Studio Does It Again

You have to hand it to Art Lebedev Studio and its amazing keyboards—it sure knows how to make fingers do the happy dance. We first took our fingers to keyboard nirvana in October 2008 with the company's insanely talented but equally insanely priced Optimus Maximus (\$1,864.35), which integrated a customizable 48- x 48-pixel OLED in each key complete with virtually endless configuration possibilities. Now the company is touting the Optimus Popularis, a scaled-down, notebook-like keyboard expected to ship by year's end in the \$1,000 neighborhood. The board lacks a numeric pad but is thinner than the Maximus, sports rounded keys, and houses a dedicated screen below the Function keys. It also bypasses the OLED approach for a full-color LED implementation, upping the resolution to 64 x 64 pixels. ▲



Not Your Daddy's Power Strip

Straight from the “power to the people” department come three power strips that scream “unique.” First is Power USB's USB Controlled Power Strip, an “energy-saving device that switches on the computer-connected peripheral devices only when needed.” Plug the strip into a PC's USB port and use the provided software to turn on and off power to the sockets. Automation abilities are also available, each port houses its own fuse, and the sockets accept plugs from all countries. Shipments are set for August at an undisclosed price. Wet Circuits' water-resistant four-plug strip, meanwhile, goes by the model name GF-3401 (\$35), and among other things uses a patented design and protective material that lets whatever is plugged into it “keep working while you are protected from being electrocuted.” Quirky's six-plug Pivot Power adjusts in circular, semicircular, and zigzag shapes and can let you insert “large adapters in every outlet.” American and European versions are available for preorder and will cost \$25. ▲



LaCie Goes To An Extreme

With such descriptors as “impenetrable,” “all-terrain,” “watertight up to 100 meters,” and “truly rugged” attached, it's not too difficult to decipher the main selling point of LaCie's new XtremKey USB drive. Beyond being heat-, cold-, water-, pressure-, and drop-resistant (tested and dropped five times and at 5 meters), LaCie says the drive's wear-resistant screw threads and rubber O-ring make it water-resistant, while the 2mm-thick zamac-constructed case is impenetrable. FYI, zamac is a “metal alloy composed of zinc, aluminum, magnesium, and copper that's so strong it can withstand the pressure of a 10-ton truck.” Speed-wise, the MIL-STD-810F-tested drive reads at up to 40MBps and writes at up to 30MBps. The drive is available in 8GB (\$49.99) to 64GB (\$249.99) sizes. ▲



Asus Joins The Big Boys

With global PC shipments up more than 80% from a year ago, Asus now ranks among the top five leaders in worldwide PC shipments, IDC research indicates. The notorious netbook maker shipped 4.318 million PCs in Q2 2010, putting in a virtual tie with Toshiba for fifth place. Both companies grabbed a 5.3% market share for the quarter vs. HP's 18.1%, Dell's 13%, Acer's 12.6%, and Lenovo's 10.2%. For the same quarter a year ago, Asus had a 3.5% share, which works out to 83.6% growth quarter to quarter. The overall PC market, meanwhile, grew 22.4% during 2Q 2010, “helping to confirm signs that businesses are moving ahead with replacements,” IDC stated. ▲

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A Breaking We Will Go

Welcome to the age of copyright-legal jailbreaking, and you can thank Librarian of Congress James H. Billington, who ruled three exemptions to the Digital Millennium Copyright Act in late July. Most notable is you're now free to jailbreak your iPhone, load non-Apple-approved apps, and break wireless carrier controls on your mobile devices to your heart's content without fear of breaking copyright law. As many have pointed out, however, this doesn't prevent Apple from disabling jailbroken phones with upgrades. Elsewhere, as the EFF put it, "amateur creators" aren't violating the DMCA now "when they use short excerpts from DVDs in order to create new, noncommercial works for purposes of criticism or comment if they believe that circumvention is necessary to fulfill that purpose." In other words, backing up original DVDs and games isn't protected. You can, however, break video game protection if done "solely for the purpose of good faith testing for, investigating, or correcting security flaws or vulnerabilities." ▲



Perl 6 By Christmas?

Could this be the year that Perl 6 finally shows its face? According to various reports, the answer is a definite maybe, as Larry Wall, creator of the historic programming language, hinted to as much at the O'Reilly Open Source Conference in his annual "state of the onion" address. Reportedly, Wall said despite Perl 6 containing a lot of bugs and running slowly, it "pretty near does exist." A stable demonstration release dubbed Rakudo Star was released July 29. Beyond introducing a new butterfly mascot named Camelia for Perl 6, which has been in development for more than 10 years, Wall reportedly stated, "Perl 6 could bring on a bloody revolution, or it could be a delightful step forward. You folks in the room will have to decide how violent or peaceful the future will be." ▲

Welcome to Perl 6

Hi, my name is Camelia. I'm the spokesbug for Perl 6, the spunky little sister of Perl 5. Like her world-famous big sister, Perl 6 intends to carry forward the high ideals of the Perl community. Perl 6 is currently being developed by a team of dedicated and enthusiastic volunteers. You can help too. The only requirement is that you know how to be nice to all kinds of people (and butterflies). Go to [#perl6](#) ([irc.freenode.net](#)) and someone will be glad to help you get started.



Community

#perl6 IRC channel
system IRC client
or chat live in your browser
Perl 6 screencasts
Blogs: Perl 6 wiki

»MORE«

Specification

Synopsis: official Perl 6 design documents
STD.pm - official Perl 6 grammar

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Compilers

Rakudo, a compiler based on Parrot
vty: a STD-based reference parser used by various other compilers

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Documentation

u3x: User-level documentation for Christmas
Perl 6 to 6: introduction for Perl 5 programmers

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Whatever

proto: makes it easy to install programs written in Perl 6
Inline::Rakudo: embedding Perl 6 code in Perl 5

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Fuzzy Goodness Oozes From Microsoft

Good news is flowing from Microsoft these days, including word that a new "Be what's next" tagline is soon to surface and profits from April to June totaled \$4.52 billion, a 48% increase from the same period last year. Credit went to Windows 7 (175 million licenses sold since launch) and Office 2010. Elsewhere, co-founder Paul Allen announced in July that he will turn most of his estimated \$13 billion fortune over to philanthropic causes upon his death, just as his early running mate Bill Gates has done. As part of the 20th anniversary of the Paul G. Allen Family Foundation, Allen stated, "Today I also want to announce that my philanthropic efforts will continue after my lifetime. I've planned for many years now that the majority of my estate will be left to philanthropy to continue the work of the Foundation and to fund nonprofit scientific research, like the groundbreaking work being done at the Allen Institute for Brain Science." ▲



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What should exist?

To me, that's the most exciting question imaginable. What do we need that we don't have? How can we realize our potential? What will it take to solve important problems and improve people's lives? What should exist, and how might we create it—right now?

I have always been captivated by new ideas that answer these questions. From technology to science to music to art, I'm inspired by those who've blurred the boundaries, who've looked at the possibilities, and said, "What if..."

In my own work, I've tried to anticipate what's coming over the horizon, to hasten its arrival, and to apply it to people's lives in a meaningful way. Challenges inspire me, whether it's pushing further into space than any private citizen ever has, as with SpaceShipOne or into the inner reaches of the human mind, as with the Allen Brain Atlas initiative. The varied possibilities of the universe have dazzled me since I was a child, and they continue to drive my work, my investments, and my philanthropy.

I hope you believe, as I do, in the inexhaustible ability of human beings to find answers to problems, to create works of beauty and originality, and to craft vital new ideas inspired by those who've gone before. The possible is constantly being redefined, and I care deeply about helping humanity move forward.

To me, there's nothing more gratifying than that.

Paul G. Allen.



The Paul G. Allen Family Foundation celebrated its 20th Anniversary with an announcement July 15 about special grants to honor founders of successful Northwest non-profits.

"Today I also want to announce that my philanthropic efforts will continue after my lifetime."

>> more



The Allen Institute for Brain Science, an independent, nonprofit medical research organization, recently announced the launch of the Allen Human Brain Atlas. The publicly available online atlas charts genes at work throughout the human brain. The data provided in this initial data release represent the most extensive and detailed body of information about gene activity in the human brain to date, documenting which genes are expressed, or "turned on" where. The Autism Science Foundation Blog wrote recently that the finished atlas, "could do for neuroscience what star charts did for Columbus."

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News

Paul Allen commits majority of his wealth to ...
Paul Allen-backed researchers launch 3-D map ...
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A fitting ovation for Blazers' boss

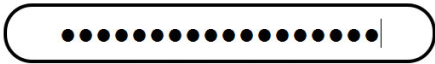
Press Releases

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Paul G. Allen Family Foundation Awards \$4.6 M...

SOFTWARE SHORTS

How Secure Is
“computerpoweruser”?

If Howsecureismypassword.net's calculations are correct, using “computerpoweruser” as a password would take a desktop PC 3 billion years to crack. The “computerpoweruser1” password pushes the length to 32 trillion years. Created by the “teeny-tiny Web-design company” Small Hadron Collider, the site uses a “(number of possible characters to the power of length of the password) divided by calculation per second” formula to get its numbers. For more on the methodology, visit the site's Q&A, which also addresses the question if testing your password on the site is even safe in the first place. “I'm not harvesting passwords into an EVIL database,” it states. “Of course that's exactly the sort of thing I would say if I were harvesting them. And it wouldn't be hard to do it: a couple of lines of code and I'd have all your passwords. Mwuhahahahahaha!” For the record, cracking “howsecureismypassword” would take 1 quadrillion years. Adding a 1 ups that to 54 quintillion years. Color us doubters. ▲

HOW SECURE IS
MY PASSWORD?


It would take
About 32 trillion years
for a desktop PC to crack your password

“The Future Of Entertainment”

Give a warm round of applause to UltraViolet, a digital locker service that represents “a new way for consumers to have greater choice, confidence, and freedom in how, when, and where they enjoy digital movies, TV shows, and other entertainment.” Backed by the DECE (Digital Entertainment Content Ecosystem), a consortium of roughly 60 tech and entertainment companies, UltraViolet aims to let you watch your digital entertainment “across multiple platforms,” including connected HDTVs, PCs, game consoles, and mobile devices. Companies in on UltraViolet include Intel, Sony, Warner Bros., Microsoft, LG, Marvell Semiconductor, Toshiba, Netflix, Best Buy, Comcast, and Panasonic. Notable absentees are Apple (for obvious iTunes reasons) and Disney, which is working on its own Keychest digital locker. A free cloud-based UltraViolet Account will reportedly let buyers access and manage their entertainment, “regardless of where it was purchased.” Look for the service to launch yet this year. ▲



The Future
of Entertainment
is UltraViolet™

Vulnerabilities
Abound & Apple
Leads The Pack

“Despite considerable security investments, the software industry at large still proves unable to produce software with substantially less vulnerabilities.” So stated Secunia CEO Niels Henrik Rasmussen in the company's recent “Secunia Half Year Report.” From 2007 to 2009, vulnerabilities affecting the typical end user's PC jumped from 220 to 420. For 2010's first half, Secunia expects the number to double again. Overall, the top 10 vendors—Microsoft, Apple, Oracle, HP, IBM, Adobe, VMware, Google, Cisco, and the Mozilla Foundation—“account on average for 38% of all vulnerabilities disclosed per year.” Apple, meanwhile, now tops Oracle for having the most vulnerabilities in its software, though not necessarily in OSes but rather third-party apps developed for them. ▲

Wi-Fi In The Sky

Remember the days when seemingly your only options for in-flight entertainment were burying your nose in a Tom Clancy novel, popping a cassette tape in your Walkman, or striking up a conversation with the cute girl the seat over? No more. According to Computerworld, one in every three domestic airplanes now offers Wi-Fi service, though at \$13 and up for three connected hours, the privilege can be pricey during longer treks. Other traveler complaints focus on confusion as to exactly which aircraft offer the service and what kind of DC power adapter users should tote along to combat Wi-Fi garbling up battery power, as some older aircraft use rounded outlets that need adapters that can run upward of \$60. Down the road, free Wi-Fi service could be a possibility—if you're traveling first-class, that is. ▲

What's The "Pulse Of The Nation?" Ask Twitter

Maybe Jim Morrison was right when he sang "the West is the best. Get here, and we'll do the rest." According to a "Pulse Of The Nation: U.S. Mood Throughout The Day Inferred From Twitter" project that Northeastern University's Alan Mislove and associates conducted, West Coasters appear happier than East Coasters. Researchers gathered 300 million tweets from 2006 to 2009 (only U.S.-based tweets including a location were considered) and evaluated them using the Affective Norms For English Words psychological word-rating system to calculate the average mood to graphically depict mood variations on maps. Overall, "the peak in the overall tweet mood score is observed on Sunday mornings and the trough occurs on Thursday evenings." Further, early mornings and late evenings showed the highest level of "happy" tweets. Arguably more interesting are the "geographic variations [that] can be observed, with the West Coast showing happier tweets in a pattern that is consistently three hours behind the East Coast." ▲



The Fine Art Of Blogging

Although it's not technically a Web site, perusing Time's recent list of "Best Blogs Of 2010" is worth your time nonetheless, if for no other reason than to compare which sites you have already bookmarked vs. what Time finds blog-worthy. Among new faves we're now reading is Hipster Runoff ("a fresh way to gently poke the ribs of the 'bed head' set"), HiLobrow ("a potpourri of intellectualism, culture trends, unexpected artistic creations, and out-of-the-box personalities"), and Information Is Beautiful ("you'll learn oodles about, say, that nasty oil slick in the Gulf of Mexico . . . or see a carbon-dioxide graphic contrasting the way America drives now vs. a possible electric-car future"). At the other end of the spectrum, Time dubs Fail Blog, The Big Lead, Perez Hilton, Mashable, and Daily Kos as all being overrated. ▲

SITE SEEING

What's The Buzz About?

One of our favorite landing sites for news, features, opinion, and more is The Daily Beast, co-founded and edited by Tina Brown, former editor of the *Tatler*, *Vanity Fair*, *The New Yorker*, and *Talk*. Our favorite feature at the site, which recently celebrated a year in business, is The Buzz Board, where "smart people recommend" what's turning them on in architecture, art, business, education, finance, history, parenting, technology, TV, travel, and other areas. Recommendations, some admittedly more useful than others, come from the likes of Judd Apatow, Rudy Giuliani, Richard Holbrooke, Scarlett Johansson, Willem Dafoe, Dustin Hoffman, Serena Williams, Arnold Palmer, and Sir Elton John. Technology-wise, Digg's Matt Van Horn, Twitter's Biz Stone, PaidContent.org's Rafat Ali, kottke.org's Jason Kottke, former Lenovo CEO William Amelio, and Scott Lamb of BuzzFeed.com are represented. ▲

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MICRO CENTER
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WWW.PATRIOTMEMORY.COM

Job Of The Month

Do you appreciate free Yoga classes in the office? Do you consider Saran Wrapping your desk fun? Or are you just a social gaming nut who likes playing titles such as Diva Life and Dante's Inferno on social networks? No online business category is hotter right now than social gaming, and major developer Lolapps is looking for developers with serious skills

and a love of office pranks. If you have the Flash skills required by most Facebook and other social network games, then you might want to apply for the company's Flash Engineer position. Not only do you need to know the core skills of game and Flash design, but Lolapps takes its company name seriously and has a clear, funny sense of what it means to be

"detail-oriented." "When someone sends you an email it auto-magically gets handled with no need for a follow-up." Lolapps wants its prospects to know what they are getting into and so they publish the latest office antics to a Flickr page of workplace pictures. These folks have a thing for Chinese dragon hats and photo booth sessions.

www.lolapps.com/career



Raw Numbers Microsoft Edition

150
million

Number of Windows 7
licenses sold as of June
23, 2010

Microsoft

13.2%

Microsoft's share of the
smartphone platform
market as of May 2010

comScore

9.85%

Share of June 2010
online searches on
Microsoft Bing

Hitwise

48

Days that Microsoft's
Kin phone was on the
market before being
discontinued

Video Ads Are OK By Us

Popular TV time-shifting portal Hulu launched its premium service in July. But even at \$9.99 a month, the service retains many of the pre- and mid-roll ads of the free service. It turns out that most of us don't mind advertising in our online video. According to research firm Frank N. Magid Associates, almost half (48%) of online video viewers believe that the spots in these video streams are as acceptable as ads in TV shows. Only 24% find the ads less acceptable, and 7% even say that they're more acceptable.

Facebook Addiction Is No Joke

Are young women actually addicted to social networking? Many of them say so, according to an Oxygen Media survey of 1,600 18- to 34-year-old women who use social media.

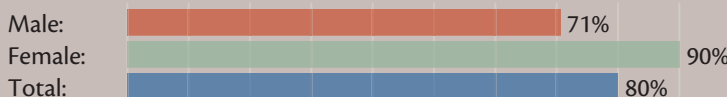
- 39% define themselves as "Facebook addicts"
- 37% have fallen asleep with their PDAs in hand
- 34% check Facebook first thing upon waking in the morning
- 26% get up in the middle of the night to read text messages
- 50% say they could rely on a Facebook friend for help in a crisis situation



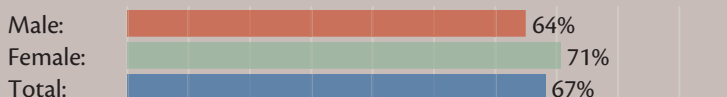
Any Idea How Fast You Were Surfing Back There?

U.S. Home Broadband
Users' Perception Of
Internet Speed By Gender,
June 2010

Do Not Know Advertised Speed Of Home Connection



Think Provider Should Always Make Sure Connection Is As Fast As Promised



Think Speed Is Always As Fast As Promised



Source: FCC



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DREAM HARDWARE

Get a leg up, fellow dreamer. Duck the phantasms reaching out of your screen. And ease on down, ease on down the road.

Epic Amp

Off-roading might seem a little weird on an ATV without an ear-splitting exhaust note, but we wager we could get used to it. After all, behind the wheel of Epic EV's Amp (reportedly \$22,000; www.evepic.com), we'd be able to hear our muddin' playlist for once. Being electric, the 54hp Amp is friendlier to the ecosystem than its four-stroke forebears, at least those parts of the ecosystem you don't physically run over. We would indeed be amped to take some ramps with this scamp. Joining it in a debut this fall will be Epic's Torq (about \$35,000). The Torq is a three-wheeled, 200hp+ electric roadster in a reverse trike configuration. ▲

amp
ALL TERRAIN



by Marty Sems

Tibion Bionic Leg



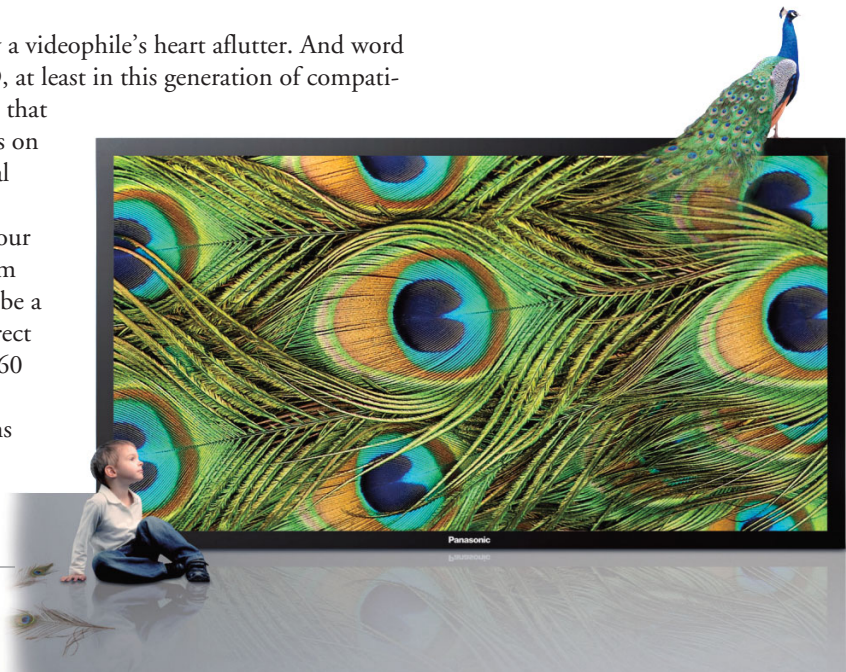
In light of all the fun things to do in this world, including but not limited to blue-rock shooting while BASE jumping on a dirt bike, we like to hedge our bets by keeping an eye on rehabilitative technology. In that vein (saphenous, we believe) there's the Bionic Leg (tibion.com). This augmentive, carbon fiber exoskeleton—Tibion calls it an active lower-limb orthosis—helps stroke patients with hemiparesis literally go through the motions of therapeutic exercises. Over time, and remarkably, bionically assisted therapy can help patients build new neurological pathways so that undamaged parts of their brains can take over leg motor control functions that have been lost for years. In the



meantime, it helps the user climb stairs, stand up from a sitting position, and more. The ARM7-powered Bionic Leg runs on Li-Ion batteries, and incorporates an OLED and Bluetooth. ▲

Panasonic TH-152UX1

The phrase "Panny plasma" has set many a videophile's heart aflutter. And word has it that plasma is the way to go for 3D, at least in this generation of compatible HDTVs. Thus it's worth mentioning that the 152-inch colossus you saw last CES is on track for a January delivery to commercial clients. Not only will the TH-152UX1 (\$500,000; www.panasonic.com) blow your mind with wall-sized 3D action, it'll warm your chilly living room, too. Should you be a bit short on time and shorter on cash, direct your stereoscopic gaze to the 4,096 x 2,160 monster's little brothers. The 103-inch (\$65,000) and 85-inch (\$45,000) editions are 1080p 3D displays, and they should ship before the end of the year. ▲



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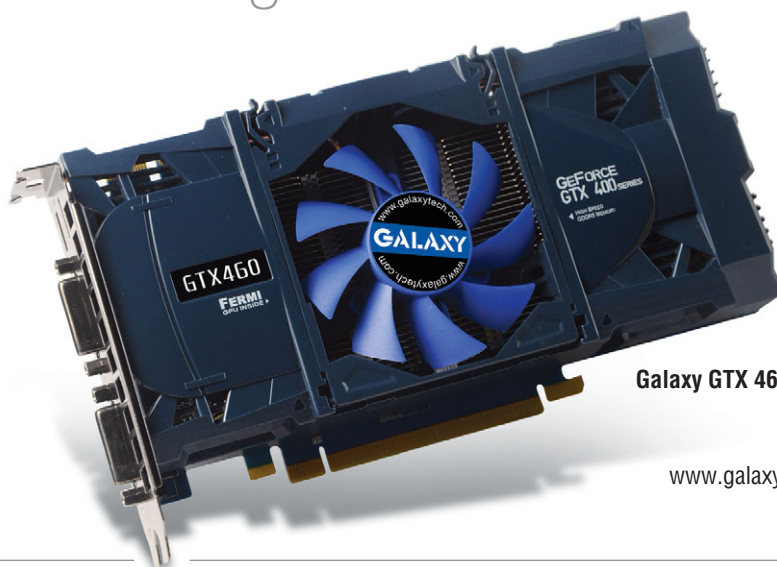
A GeForce GTX 460 Smorgasbord

This article was almost a GeForce GTX 465 roundup. In it, we would have introduced you to Nvidia's latest attempt to disable even more functional units of the hot and noisy GF100 to make it, well, less hot and noisy.

But as we began to request GTX 465s, card makers kept telling us something much better was in the pipeline. Just wait a couple weeks, they told us. That "something" was the GeForce GTX 460, and when the wait was over, we shifted gears, dropped the GTX 465 like a hot potato, and decided to focus on the GPU that has the potential to rock gaming's socks off.

The GeForce GTX 460's GPU, the GF104, is composed of two GPCs (Graphics Processing Clusters) compared to full Fermi's four, but these GPCs aren't just carbon copies of those in the GF100; they're modified to include another 64 of Nvidia's all-purpose pixel processors, or CUDA cores. For each of the GF 104's eight streaming multiprocessors, there are an additional 16 CUDA cores and twice the number of special function units and texture units, compared to the GF100. Like the Green Squad did with the GF100 inside the GTX 480, Nvidia hobbled the GF104 bolted to the chassis of the GTX 460: It has one of its SMs disabled. The full GF104 supports 384 CUDA cores, but the cards reviewed here only have 336 of them active. The GTX 460's GPU also features 56 texture units. The graphics, processor, and memory clocks are set to 675MHz, 1,350MHz, and 1,800MHz, respectively.

The GTX 460 actually comes in two flavors, one with a 256-bit memory controller and the other with a 192-bit memory controller. The card's installed memory also varies between versions. The former comes equipped with 1GB



Galaxy GTX 460 GC 1GB

\$234.99

Galaxy

www.galaxytech.com



Galaxy provides a mini HDMI cable, a pair of 4-pin to 6-pin PCI-E power connectors, and a DVI-to-VGA adapter.

GDDR5, and the latter includes 768MB GDDR5. Other differences include 512KB L2 cache and 32 ROPs for the 1GB version and a 384KB L2 cache and 24 ROPs for the 768MB version. Nvidia's pricing for the better-performing 1GB variant is \$229, while the 768MB variant will set you back \$199.

How We Tested

To test the GeForce GTX 460 1GB and 768MB cards, we slotted them into MSI's Big Bang XPower motherboard, installed Intel's 3.33GHz Core i7-980X Extreme Edition processor, loaded the system up with 6GB Crucial DDR3-1600 RAM, and ran Windows 7 Enterprise Edition on a 128GB Patriot Zephyr SSD. We tested the cards against AMD's ATI Radeon HD 5830, which was selling at the same price as the 768MB GTX 460s as we went to press, to give you a good idea how Nvidia's latest

GPU ranks against ATI's aging 5000 series in real-world gaming scenarios. We also down-clocked the Evga GTX 460 to achieve baseline GTX 460 scores, so you can see the difference each manufacturer's overclocked settings will yield. For the ATI card, we used Catalyst 10.6 drivers, and we used ForceWare 258.96 to test Nvidia's cards.

Galaxy GTX 460 GC 1GB

As we went to press, Galaxy offered four varieties of GeForce GTX 460, and the one the company sent us is the slightly over-clocked GC version with a 256-bit bus and 1GB GDDR5. For a \$5 premium, Galaxy bumped the core clock by 25MHz and memory clock by 48MHz. All four cards sport identical fansinks, which Galaxy claims feature the world's first detachable fan. The tangible upshot of this design is that you can easily access the card's aluminum/copper heatsink for fuss-free



Evga GeForce GTX 460 SuperClocked EE
\$249.99

Evga
www.evga.com



cleaning. A potential downside is that the card features a rather porous shroud, and it'll vent its heat all over the rest of your PC components. In practice, the GTX 460 is significantly cooler than the full-sized Fermi, and a case with GPU-centric cooling should be more than capable of adequately venting the heat this card generates when running flat out. The back panel features a pair of DVI ports and a mini HDMI port. Galaxy provides a mini HDMI cable, a pair of 4-pin to 6-pin PCI-E power connectors, and a DVI-to-VGA adapter.

In the tests, this card outpaced the stock GTX 460 by a few frames per second in nearly every benchmark and easily outscored the Radeon HD 5830 across the board. The boost is easily worth it for the tiny extra you'll end up paying for this card. If you live in a particularly dusty environment, however, then the detachable fan could let you improve the lifespan of your card considerably.

Evga GeForce GTX 460 SuperClocked EE

Evga's take on the GTX 460 is less flashy than Galaxy's, but that doesn't mean design was an afterthought. The "EE" in this card's model name refers to External Exhaust, which means that the heatsink

The "EE" in this card's model name refers to External Exhaust, which means that the heatsink shroud is fully enclosed to expel GPU-generated heat right out the back of your case.

shroud is fully enclosed to expel GPU-generated heat right out the back of your case. Under the hood, Evga tweaked the core and memory clocks to 763MHz and 1,900MHz, respectively. That's very nearly a 100MHz boost for core and memory clocks, which gives you a clue as to why Evga is charging an extra \$20 over the price for the stock 1GB GTX 460.

But that's just the tip of the overclocking iceberg for this card; Evga also ships this GTX 460 with its Special Edition Evga Precision and OC Scanner utilities, which work in tandem to help you to overclock the card, stress-test your settings, and view and manage fan speeds. Like the Galaxy card, Evga's model also features two DVI ports and a mini HDMI port. You'll also find a mini HDMI-to-HDMI adapter, a DVI-to-VGA adapter, and a pair of 6-pin PCI-E power adapters.

We weren't surprised to see that the Evga model was the second-best-performing card we tested (it features the second highest core clock), but with a little patience, you could easily overclock this thing to yield even more impressive results. Evga also offers customers a lifetime warranty (don't forget to register) and the Evga Step Up program, which lets you swap this card for a more expensive model anytime within the next 90 days by just paying the difference. If your case doesn't feature dedicated graphics card cooling, we recommend opting for this card above the others reviewed here.

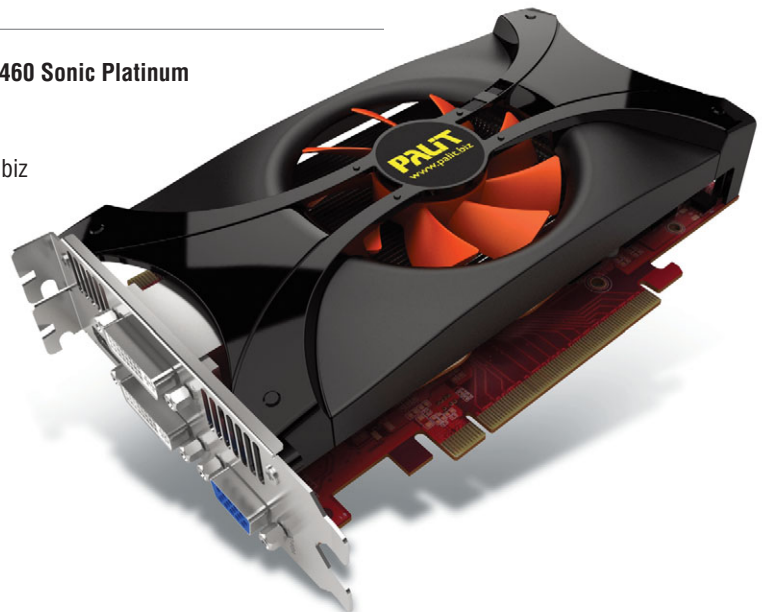
Palit GTX 460 Sonic Platinum

At the top of the MHz heap is Palit's GTX 460 Sonic Platinum. This card features an impressive 800MHz core clock, which is a full 125MHz above the stock model. The memory clock comes in at

Palit's GTX 460 features the same pair of DVI ports but thankfully drops the mini HDMI port in favor of a full-sized version.

Palit GTX 460 Sonic Platinum

\$249.99
Palit
www.palit.biz



Although it sports an open heatsink shroud, Gigabyte claims that the Windforce 2X will actually improve airflow inside your case.

Gigabyte GeForce GTX 460 1GB

\$229.99

Gigabyte

www.gigabyte.us



Sparkle GeForce GTX 460 768MB

\$199.99

Sparkle

www.sparkle-usa.com



Sparkle was kind enough to offer an option for bargain hunters who can't stomach paying over \$200 for a graphics card. You know who you are.

2,000MHz, which is 200MHz above the stock setting.

One thing to note: The card we received is an engineering sample that was shipped with a heatsink on the VRM. Retail models won't include the VRM heatsink. To get closer to the real-world results you'll experience, we removed the VRM heatsink and benchmarked the card to see if the stability would be adversely affected. It was not. Like other cards in this roundup, Palit's features an open heatsink shroud, so much of the card's heat will be recirculated throughout the interior of your case. As stated above, this shouldn't be too much of a problem for a well-ventilated case.

Palit's GTX 460 features the same pair of DVI ports but thankfully drops the mini HDMI port in favor of a full-sized version. This card's backplane also includes a VGA port. You'll need your own HDMI cable, though, because Palit bundled a single 6-pin PCI-E power connector and nothing else.

In the tests, as you might imagine, the GTX 460 Sonic Platinum trounced the Radeon HD 5830 by the widest margin; and these are differences you'll notice in everyday gaming, but to be fair, this card is more expensive than ATI's by a similar margin. This card also bloodied the rest of our GTX 460s. If you want one of the fastest GTX 460s available, then this card is your best option.

Gigabyte GeForce GTX 460 1GB

All of the GTX 460s we tested feature custom coolers, but only Gigabyte favors a twin prop. According to Gigabyte, the pair of fans in the Windforce 2X cooler feature specially inclined fins, which reduce turbulence and, as a result, are quieter than you might expect. In our tests, the Gigabyte card was as quiet as any of the other cards we tested. Although it sports an open heatsink shroud, Gigabyte claims that the Windforce 2X will actually improve airflow inside your case.

Gigabyte takes a rather modest route to overclocking here, bumping the core to 715MHz and leaving the memory clock set to the stock 1,800MHz. There are no surprises in the backplane of Gigabyte's

What is your heart beat?



Toughpower XT Modular Cable Management



If this was the heart beat of a person, everyone should be worried. But fortunately, this is the "heart beat" of the all new Thermaltake Toughpower XT Series power supply. You see, unlike us humans, the performance of a PC power supply is measured by how stable it can withstand during those marathon gaming sessions. Designed with the most advanced double-forward & DC to DC Converter design along with highest-grade Japanese capacitors & solid state capacitors with ability to withstand up to 105°C (221°F), Toughpower XT series power supply is able to deliver unprecedented performance with exceptional voltage regulation, power efficiency and long-lasting reliability that are unrivaled by any of current power supplies on the market. The key to stay ferocious till the end.

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offering. Here you'll find the pair of DVI ports and a mini HDMI port. Bundled accessories consist of a DVI-to-VGA adapter, two 6-pin PCI-E power connectors, and an HDMI-to-mini-HDMI adapter.

The Gigabyte card's mild overclock lets it outpace both the stock GeForce GTX 460 and Galaxy's GC variant, and we also appreciate that it comes with the stock model's price tag. With Gigabyte's familiar 2-ounce copper PCB and copper-heatpiped cooler, we imagine you'll be able to eke out a few more MHz from the core and memory. Unfortunately, you'll need to use the BIOS or third-party software to do it.

Sparkle GeForce GTX 460 768MB

No GeForce GTX 460 roundup would be complete without at least one of the 768MB variants, and Sparkle was kind enough to offer an option for bargain hunters who can't stomach paying over \$200 for a graphics card. You know who you are.

This card is as close to the reference design as you'll see. The heatsink shroud is enclosed, and a single fan sits atop a radial aluminum heatsink with a pair of copper heatpipes. Although it's nothing flashy, we do like that a majority of the heat this card produces will get shuttled out the backside of the case. The GPU underneath it all is clocked at the stock setting, 675MHz, and the six Samsung 128MB GDDR5 chips are each clocked at 1,800MHz. As mentioned above, the 768MB-equipped GTX 460 has a narrower 192-bit memory bus. The backplane of this card features two DVI ports and a mini HDMI port. Bundled accessories include a mini HDMI cable, a pair of 4-pin to 6-pin PCI-E power connectors, and a DVI-to-VGA adapter.

In the benchmarks, the 768MB GTX 460 was rather memory-limited, especially when it came to the DirectX 11 benchmarks run at the highest resolutions. For this reason, we think the Radeon HD 5830 performs rather well compared to this card and only loses out if you consider 3D Vision Surround (requires SLI), PhysX, and Nvidia's CUDA prowess significant advantages. If you do, then Sparkle's offering could be the upgrade you're looking for.



MSI N460GTX Cyclone 1GD5/OC

\$234.99 | MSI

us.msi.com



MSI ships its GTX 460 with its Afterburner software, which lets you overclock core, shader, and memory clocks and monitor temperatures and fan speeds.

MSI N460GTX Cyclone 1GD5/OC

The GTX 460 from MSI scraps the heatsink shroud entirely for the Cyclone cooler, which consists of a radial aluminum heatsink, a large fan, and two fin-adorned heatpipes that extend beyond the top of the PCB (cramped case owners beware). According to MSI, the cooler is 15.7% quieter than the reference cooler. All that cooling is nice to have, considering MSI overclocked the core to 725MHz. The memory clock, on the other hand, remains at the stock 1,800MHz. MSI also touts the card's solid-state capacitors, chokes, and Hi-C capacitors, which are designed to support a longer life span and the rigors of overclocking.

MSI ships its GTX 460 with its Afterburner software, which lets you overclock core, shader, and memory clocks and monitor temperatures and fan speeds. The backplane has a pair of DVI ports and a mini HDMI port. In addition to the overclocking software, MSI bundles two PCI-E power adapters, a DVI-to-VGA adapter, and a DVI-to-HDMI adapter.

It should come as no surprise that this card performed slightly better than the Gigabyte variant but wasn't quite able to catch up to those of Palit and Evga. MSI's offering is every bit as compelling as Evga's, though, especially because the path to overclocking is so easy thanks to the bundled Afterburner software. Sure, the factory overclock isn't much to write home about, but DIY overclockers should be able to even the score.

Final Thoughts

Nvidia's GeForce GTX 460 should make AMD/ATI sit up and take notice. It's priced right and performs well against the Radeon HD 5830. That gives gamers with more limited budgets a chance to boost frame rates, raise resolutions, and play their games like never before. We also liked that Nvidia gave card makers the go-ahead to sell custom coolers and, in several cases, impressive overclocks. Variety abounds here; serious gamers should have no trouble finding the right GTX 460 for their rig. ▲

by Andrew Leibman

Specs & Scores

	Radeon HD 5830	Stock GeForce GTX 460	Galaxy GTX 460 GC 1GB	Evga GeForce GTX 460	Palit GeForce GTX 460	Gigabyte GeForce GTX 460	Sparkle GeForce GTX 460	MSI N460GTX Cyclone 1GD5/OC
Price	\$199.00	\$229.99	\$234.99	\$249.99	\$249.99	\$229.99	\$199.99	\$234.99
Core Clock	800MHz	675MHz	700MHz	763MHz	800MHz	715MHz	675MHz	725MHz
Memory Clock	2,300MHz	1,800MHz	1,848MHz	1,900MHz	2,000MHz	1,800MHz	1,800MHz	1,800MHz
Memory Interface	256-bit	256-bit	256-bit	256-bit	256-bit	256-bit	192-bit	256-bit
Memory	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	768MB GDDR5	1GB GDDR5

3DMark Vantage Performance

Performance (1,280 x 1,024)

Overall	P15378	P14782	P15213	P16393	P16923	P15586	P13778	P15677
GPU Score	13146	12570	12981	14132	14679	13347	11615	13434
GPU1 (fps)	40.09	38.22	39.61	43.05	44.84	40.4	35.67	40.9
GPU2 (fps)	36.87	35.38	36.38	39.68	41.1	37.75	32.32	37.75
CPU Score	31345	31301	31412	31529	31252	31367	31227	31405
CPU1 (Plans/s)	4385.50	4379.34	4381.56	4412.89	4385.62	4384.71	4366.57	4380.35
CPU2 (Steps/s)	40.34	40.28	40.76	40.54	39.89	40.46	40.25	40.76

3DMark Vantage Extreme

Extreme (1,920 x 1,200)

Overall	X6240	X6600	X6893	X7430	X7753	X6960	X6067	X7099
GPU Score	5987	6337	6622	7143	7457	6687	5821	6821
GPU1 (fps)	19.81	20.06	20.86	22.55	23.67	21.2	18.53	21.51
GPU2 (fps)	15.19	17.02	17.89	19.24	19.96	17.92	15.52	18.41
CPU Score	31371	31307	31220	31484	31370	31340	31226	31472
CPU1 (Plans/s)	4398.14	4361.03	4368.23	4392.79	4389.95	4379.7	4372.1	4393.54
CPU2 (Steps/s)	40.15	40.77	40.17	40.81	40.35	40.46	40.1	40.75

Games

1,280 x 1,024

Left 4 Dead (8XAA, 16XAF)	111.84	123.69	127.36	135.07	140.79	127.71	108.35	129.12
Far Cry 2 (8XAA)	41.52	80.00	83.62	89.95	92.96	85.01	72.37	85.75
Dirt 2 (8XAA)	50.20	60.8	62.6	61.7	51.8	63.3	53.2	84.3
S.T.A.L.K.E.R.:								
Call of Pripjat (4XAA)	30.00	34.5	35.7	38.5	40.2	36.32	30.8	36.8

1,920 x 1,200

Left 4 Dead (8XAA, 16XAF)	76.02	79.31	81.8	87.02	90.67	82.07	69.47	82.85
Far Cry 2 (8XAA)	30.16	57.65	59.44	63.03	66.58	60.30	49.77	60.96
Dirt 2 (8XAA)	46.20	36.6	36.7	60.4	36.9	48.3	38.8	60.2
S.T.A.L.K.E.R.:								
Call of Pripjat (4XAA)	18.05	20.8	21.5	23.3	24.3	21.9	17.4	22.1

2,560 x 1,600

Left 4 Dead (8XAA, 16XAF)	49.46	48.81	50.45	53.68	55.77	50.57	43.17	50.95
Far Cry 2 (8XAA)	19.49	36.61	37.72	40.55	42.14	38.58	21.58	38.79
Dirt 2 (8XAA)	28.60	20.9	31.8	32	34.9	24.4	N/A	24.4
S.T.A.L.K.E.R.:								
Call of Pripjat (4XAA)	10.40	11.9	12.3	13	13.7	12.5	2.7	12.6

AMD Driver: Catalyst 10.6

Nvidia Driver: ForceWare 258.96

Test system specs: Processor: 3.33GHz Intel Core i7-980X Extreme Edition; Motherboard: MSI Big Bang XPower; RAM: 6GB Crucial DDR3-1600; Hard drive: 128GB Patriot Zephyr SSD; Topower 1100-W PSU

Gamer Paladin D805

- Intel® Core™ i3-530 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Intel® H55M Chipset Motherboard
- NVIDIA® GeForce™ GT240 1GB Video Card - DirectX 11 Support
- PSI CyborgX Gaming Case + 450W Power Supply
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound
- Optional: NVIDIA® 3D Vision Glasses and Monitor (+\$639)

\$659



Components included with system



• Intel® Core™ i7-875K Processor	\$899
• Intel® Core™ i7-870 Processor	\$869
• Intel® Core™ i5-760 Processor	\$759
• Intel® Core™ i5-670 Processor	\$859
• Intel® Core™ i5-660 Processor	\$759
• Intel® Core™ i5-655K Processor	\$759
• Intel® Core™ i5-650 Processor	\$729
• Intel® Core™ i3-540 Processor	\$659

• Intel® Core™ i7-875K Processor	\$1119
• Intel® Core™ i7-870 Processor	\$1079
• Intel® Core™ i5-760 Processor	\$979
• Intel® Core™ i5-670 Processor	\$1079
• Intel® Core™ i5-660 Processor	\$979
• Intel® Core™ i5-655K Processor	\$979
• Intel® Core™ i5-650 Processor	\$949
• Intel® Core™ i3-540 Processor	\$879



LAN Warrior II-55

- Intel® Core™ i3-540 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Gigabyte H55M-USB3 Motherboard
- NVIDIA® GeForce™ GTX465 1GB Video Card - DirectX 11 Support
- NZXT Vulcan Gaming Case + 700W Certified Power Supply
- High Definition Surround 3D Premium Sound
- Optional: NVIDIA® 3D Vision Glasses and Monitor (+\$639)



Components included with system

\$879

Gamer Paladin D845

- Intel® Core™ i7-930 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Asus® P6T SE Intel® X58 Chipset Motherboard
- NVIDIA® GeForce™ GTX 250 1GB Video Card
- Chimera Inferno 2 Gaming Case + 700W Power Supply
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound
- Optional: NVIDIA® 3D Vision Glasses and Monitor (+\$639)

\$1079



Components included with system



• Intel® Core™ i7-980X Processor Extreme Edition	\$1899
• Intel® Core™ i7-970 Processor	\$1719
• Intel® Core™ i7-960 Processor	\$1399
• Intel® Core™ i7-930 Processor	\$1079

- Intel® Core™ i7-980X Processor Extreme Edition \$2089
- Intel® Core™ i7-970 Processor \$1929
- Intel® Core™ i7-960 Processor \$1599
- Intel® Core™ i7-930 Processor \$1279



\$1279

Gamer Paladin D865

- Intel® Core™ i7-930 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Gigabyte GA-X58A-UD3R, USB3 + SATA3 Motherboard
- ATI® Radeon™ HD 5770 1GB Video Card - DirectX 11 Support
- NZXT® Guardian 921 Gaming Case + 700W Power Supply
- Kingston® 30GB SSD (Boot) + 1TB SATA3 HDD (Data)
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound



Components included with system

Gamer Paladin D885

- Intel® Core™ i7-930 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Gigabyte GA-X58A-UD3R, USB3 + SATA3 Motherboard
- NVIDIA® GeForce™ GTX470 1280MB Video Card - DirectX 11 Support
- Thermaltake V9 Green Gaming Case + 800W SLI™ Certified Power Supply
- Intel® 40GB SSD (Boot) + 2TB SATA3 HDD (Data)
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound
- Optional: NVIDIA® 3D Vision Glasses and Monitor (+\$639)

\$1939



Components included with system



• Intel® Core™ i7-980X Processor Extreme Edition	\$2699
• Intel® Core™ i7-970 Processor	\$2559
• Intel® Core™ i7-960 Processor	\$2239
• Intel® Core™ i7-930 Processor	\$1939

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iBUYPOWER Recommends Windows® 7 Home Premium

GRAB YOUR GEAR Prepare for Battle



Zalman GS1000 Plus



Thermaltake Level 10



\$1299

Intel® Core™ i7 Mobile Processor

- i7-920XM (8MB L3 Cache, 4x 2GHz) \$2194
- i7-840QM (6MB L3 Cache, 4x 1.73GHz) \$1659
- i7-740QM (4MB L3 Cache, 2x 1.73GHz) \$1409
- i7-620M (4MB L3 Cache, 2x 2.66GHz) \$1434

Intel® Core™ i5 Mobile Processor

- i5-540M (3MB L3 Cache, 2x 2.53GHz) \$1349
- i5-520M (3MB L3 Cache, 2x 2.40GHz) \$1299

Battalion 101 LX-797

- Intel® Core™ i5-520M Mobile Processor
- Intel® HM55 Chipset
- Genuine Windows® 7 Home Premium 64-Bit Edition
- 17" WUXGA 1680 x 1050 Widescreen LCD Display
- 4GB DDR3-1333 Memory
- 500GB S-ATA Hard Drive
- ATI® Radeon™ HD 5870 Mobility DDR5 1GB Video Card
- Removable 8x DVD±R/±RW Drive
- 802.11n Mini Wi-Fi Card
- Built-in 2.0 Mega Pixels Digital Camera
- GB Ethernet LAN & 56K Modem
- Built-in 1x IEEE-1394 FireWire Port
- Built-in 4-in-1 Media Card Reader/Writer
- Free Deluxe Carrying Case



\$1049

Intel® Core™ i7 Mobile Processor

- i7-920XM (8MB L3 Cache, 4x 2GHz) \$1929
- i7-840QM (8MB L3 Cache, 4x 1.73GHz) \$1399
- i7-740QM (6MB L3 Cache, 4x 1.73GHz) \$1194
- i7-620M (4MB L3 Cache, 2x 2.66GHz) \$1164

Intel® Core™ i5 Mobile Processor

- i5-540M (3MB L3 Cache, 2x 2.53GHz) \$1089
- i5-520M (3MB L3 Cache, 2x 2.40GHz) \$1049

Battalion 101 CZ-12

- Intel® Core™ i5-520M Processor
- Intel® HM55 Chipset
- Genuine Windows® 7 Home Premium 64-Bit Edition
- 15.6" Full HD 1920x1080 Widescreen LCD Display
- 4GB DDR3-1333 Memory
- 500GB S-ATA Hard Drive
- ATI® Radeon™ HD 5650 1GB Video Card
- Removable 8x DVD±R/±RW Drive
- 802.11n Mini Wi-Fi Card
- Built-in 1.3 Mega Pixels Digital Camera
- GB Ethernet LAN
- 2x USB 2.0 Ports; 1x HDMI Port; 1x eSATA/USB Port
- 3-in-1 Built-in Media Card Reader
- Free Deluxe Carrying Case

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OCZ RevoDrive 120GB

Can two SSDs offer better value than four? We pitted OCZ's RevoDrive, featuring a discrete 60GB bank of NAND memory on each side of a PCI-E x4 card, against our recently reviewed Apricorn PCI Drive Array with four attached Western Digital SSDs. Each 60GB bank runs under a SandForce SF-1200 controller, and both joined together as a RAID 0 yield a 111GB volume. You could accomplish this with a pair of SandForce-based SSDs and Windows-based RAID, but, pricing aside, this route would put more load on the CPU.

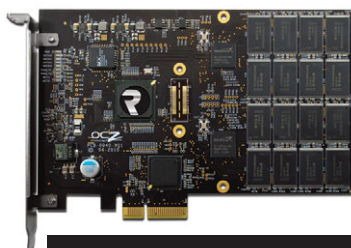
Unlike some other PCI-E-based SSD products, the RevoDrive is bootable,

making it an excellent alternative to a dual-drive boot volume. We tested with pre-release Silicon Image drivers, but final drivers should be available for download by the time you read this.

We expected the OCZ to bring a bit more than half of Apricorn's quad-drive performance, figuring scaling from two drives to four in a single RAID 0. Our benchmarks indeed show a roughly 1:2 comparison with Apricorn in many cases, but in some instances OCZ either pulls even or ahead. In Iometer, Apricorn keeps the advantage in sequential operations, but in random ops—the kind typical of database and operating system use—the two

are eerily similar. Given the cost savings, the RevoDrive is a persuasive option. ▲

by William Van Winkle



RevoDrive 120GB

\$399.99

OCZ

www.ocztechnology.com



Specs: Capacity: 120GB; Interface: PCI-E x4; Max. read/write (advertised): 540MBps/480MBps; MTBF: 2 million hours; Power consumption: 3W idle, 8W active

Benchmark Results

	OCZ RevoDrive 120GB	Apricorn PCI Drive Array*
CrystalDiskMark 3.0** (read/write)		
Seq	377.8/196.6	636.8/461.1
512K	350.4/191	416.9/315.8
4K	24/76.44	17.11/29.12
4K QD32	212.9/186.2	68.52/79.65
ATTO Disk Benchmark** (read/write)		
4K	136.6/171.7	85.9/77.8
32K	419.9/432.2	555.9/354.8
256K	518.4/468.2	610/440.6
1024K	528.9/467.9	595/434.9
Iometer (6/22/2008 RC2) @ 128K		
Random 100% Read		
IOPs	1517.88	1553.29
MBps	189.74	194.16
Random 100% Write		
IOPs	822.84	844.72
MBps	102.85	105.59
Sequential 100% Read		
IOPs	1943.75	4765.97
MBps	242.97	595.75
Sequential 100% Write		
IOPs	802.49	3426.22
MBps	100.31	428.28

*Tested with four Western Digital SiliconEdge Blue 256GB SSDs

**Results in MBps

Antec Dark Fleet DF-85

We thought we would dislike Antec's choice of plastic over metal in its new performance tower's exterior. We thought the omission of some tool-less assembly would chafe. We were wrong. The DF-85's bars-and-mesh design is very solid yet lightweight, having something of a SWAT aesthetic. All of that black hotness is punctuated by five 120mm red LED case fans: two in the back and three fronting the hard drive bays. The additional two black 140mm fans mounted in the top and an option for another 120mm fan above the graphics cards and set into the clear side paneling—not to mention the case's pre-cut and rubberized holes for watercooling—almost seems overkill. Almost.

Antec includes rubber grommets to dampen drive vibration, and there are

tool-less rails for 5.25-inch drive installation. We really love the two Fleet-Swap brackets that can move to any position on the main 3.5-inch drive cage. Each of these brackets host two SATA data and power connectors, effectively creating a low-budget, flexible, passive backplane for your hot-swappable data drives.

We can overlook Antec going light on cable management features. The only real design flaw with the DF-85 is its workaround for the front-mounted USB 3.0 port. Because there's no standard yet for on-motherboard USB 3.0 headers, Antec opted to let users route the



Dark Fleet DF-85

\$189.99 | Antec

www.antec.com

attached USB 3.0 cable from the port through the case, out through a rear expansion card shim, and then back into one of the motherboard's I/O panel USB

3.0 ports. We'd have much preferred a set of loose header wires plugged into a removable USB 3.0 adapter, allowing for today's setup and tomorrow's on-board standard.

Still, Antec delivers gobs of expansion capacity, great workmanship, and plenty of convenience features where they matter most. ▲

by William Van Winkle

Specs: Dimensions: 23.5 x 8.4 x 19.9 inches (HxWxD); Weight: 24.2 lbs.; Motherboard compatibility: ATX, microATX, Mini-ITX; Bays: Up to 9 3.5-inch internal, 3 5.25-inch external, 1 2.5-inch external SATA (top), 1 2.5-inch internal

CPU RANKING ○ ○ = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

PC Power & Cooling Silencer Mk II 750W

If high efficiency and silent operation are important to you, PC Power & Cooling's Silencer Mk II 750W is worth consideration for your next rig. PC Power & Cooling rates it as 88% efficient under typical load, and the Silencer Mk II 750W also boasts regulation within 2% for the 3.3V, 5V, and 12V DC outputs. The aptly named Silencer features a 135mm, ball-bearing, thermally controlled fan that sits on the bottom of the unit, and we found it nearly noiseless during the entire testing process.

We installed the Silencer Mk II 750W into our test unit with a 3GHz Intel Core 2 Quad, two BFG GeForce GTX 275s in SLI, and a 1TB Western Digital Caviar Blue. The cables, which are not modular, were long enough (between 19 and 23.6 inches long) to reach all the components inside our full-size Lian Li PC-A7010 case. Power users will appreciate the availability of four PCI-E (two 6-pin, two 6+2-pin)

connectors and support for both ATX12V and EPS12V motherboard power. There are eight SATA connectors split between two cables, which gave us the flexibility to run one set to the top of our case and a second to the bottom.

To test the Silencer Mk II 750W, we simultaneously ran SiSoftware Sandra's Burn-In Wizard with the S.T.A.L.K.E.R. Call Of Pripyat benchmark running in foreground for around 30 minutes. At peak, the system hit 445 watts with a power factor of .967. PC Power & Cooling backs up the power supply with a seven-year warranty, so it'll likely last the entire life of your system. ▲

by Nathan Lake



Silencer Mk II 750W
\$159.99
PC Power & Cooling
www.pcpower.com

Specs

Rated continuous (W)	750 (at 50 C)
12V Rails	1
+12V max (A)	62.4
+5V max (A)	25
+3.3V max (A)	25
SLI/CrossFire-certified	SLI
Max wattage tested	445
Power factor tested	96.7
Efficiency rating (as advertised)	88%
Cable side	motherboard
Fan location	Bottom
Fan(s)	135mm
PCI-E	4 (two 6+2 pin) (two 6 pin)
Main 12V	20+4-pin
8-pin EPS 12V	1
4-pin 12V	1
SATA	8
4-pin Molex	7
Floppy	1
Length (including cable bend)	8.2 inches
Warranty	7 years

Enermax Aeolus N14 CP002N-B

Notebook cooling pads fit into that category of computer accessories you intend to try out. But, cooling pads are usually low on the to-buy list compared to the number of trinkets you want to add to your demanding desktop rig. So, if a review of a new cooling pad gives you an excuse to get one for yourself, perk up, because we're taking on the Enermax Aeolus CP002N-B cooling fan.

Right away you'll notice that the CP002N-B is fairly compact and obviously designed for computing on a flat surface. As far as any assembly goes, we only had to snap the 140mm fan into its four designated clamps. The cooling pad includes two USB ports, but powering it only requires connecting to one port.

There are five rubber grips attached to the bottom of the cooling fan that are



Aeolus N14 CP002N-B
\$29 | Enermax
www.enermax.com

successful at keeping the pad stable. To test them, we shifted around one of our heavier laptops on the top of the CP002N-B just

to see if it would hold its own—it did. Although durability isn't an issue, you won't want to tilt back your notebook display too far beyond 100 to 110 degrees, otherwise you'll be picking up a toppled over notebook more often than not.

The CP002N-B's fan is almost pin-drop quiet. It pumps out even airflow to consistently disperse heat from the notebook. Moreover, the coverage area of the mesh is large enough to cool thin and light notebooks (with no greater than a 13.3-inch display), along with netbooks and tablets.

Ideally, there should be at least four rubber grips on the top for some added stability. Even so, the CP002N-B shouldn't shift around on an airplane tray table, though any rough turbulence might challenge Enermax's design. As a lightweight portable pad, it won't be a burden to store it in your backpack, either. ▲

by Joanna Safford

Specs: Dimensions: 1.77 x 10.63 x 8.66 inches (HxWxD); Materials: aluminum, plastic, steel; Lights: 4 blue LED; Fan size: 140mm; Ports: 2 USB 2.0; USB cable length: 500mm; 5 rubber grips

Sentey GS-6400R Arvina

Sometimes a cool, attention-getting case substitutes style for substance. The Sentey GS-6400R Arvina, on the other hand, has plenty of both.

Painted like a bright red sports car and with red LEDs on all the fans, the case is plenty flashy, but it's also well-built and smartly designed. The Japanese steel feels predictably solid, but even the plastic pieces on this case feel sturdy.

The top of the case has four USB 2.0 ports, microphone and headphone jacks, and eSATA and SATA ports, with a spring-loaded, clear plastic cover that keeps the dust out. It also has four fan switches, so you can quickly and easily enable or disable fans in various parts of the case.

The hard drive bay easily slides in and out, and mounting hard drives or optical drives is a tool-less cinch.

A great product always has extra details that make it that much better than a cheaper version. For example, the Arvina has a tiny toolbox tucked away in the corner of the case that contains a small screwdriver, all the screws, extra pieces of this and that, and a fingerprint cloth. Additionally, the case



GS-6400R Arvina
\$139.99 | Sentey
www.sentey.com

has a pair of fans positioned above the expansion slots to keep your graphics card(s) cool, and it's connected with a hinge so you can swing the fans out of your way when working inside the case.

There are a few parts of this case that are cumbersome. Removing the side panels required a bit of elbow grease, and the spring-loaded ODD front covers didn't seem to work properly. Mounting

the PSU was more awkward than I would have liked, requiring more effort than usual to align the the PSU's screw threads with the corresponding holes on the case.

Otherwise, this case is nearly perfect. ▲

by Seth Colaner

Specs: Case type: Full tower; Materials: Steel, plastic; Motherboard support: ATX, microATX, E-ATX; Bays: 5 5.25-inch external, 5 3.5-inch internal; Expansion slots: 7; Dimensions: 20.47 x 8.42 x 21.65 inches (HxWxD); Fans: 2 80mm side, 1 120mm front, 1 120mm rear, 2 120mm top; Top ports: 4 USB 2.0, 1 eSATA, 1 native SATA (power and data), mic in, headphone jack; Media: Built-in card reader (CF/MD, XD, SD/MMC, TF, and MS/M2)

Zalman ZM-NC2500Plus

It's always nice to find a piece of equipment that does what the manufacturer says it'll do and does it for a reasonable price. The Zalman ZM-NC2500Plus is one of those pieces of equipment. Nothing flashy, it's nonetheless an aesthetically pleasing addition to your office at work or at home. More importantly, it's quiet, efficient, and effective, lowering notebook temps even as it adds features to your setup.

The ZM-NC2500Plus is an active cooling device that uses dual 50mm fans to draw cool air in from beneath the platform and direct that air into your notebook. The matte black platform itself is tilted to provide ergonomically appropriate access to your notebook's keyboard and other controls, and it's large enough to handle 17-inch laptops. It also features rubber grips to prevent the notebook

ZM-NC2500Plus
\$69.99
Zalman
www.zalman.com



from sliding and movable feet that enable you to adjust the height of the platform.

Although the fans can be USB-powered, you can also use an optional 5V power supply for extra punch. The platform also acts as a generic hub, with three additional USB ports at the rear; you'll want to use the 5V power supply if you're going to connect USB-powered devices to the additional ports. Also at the rear of the platform is a potentiometer that controls the speed of the fans.

But there's more: Beneath the cooling platform resides a bay for a 2.5-inch

hot-swappable SATA drive—handy, for example, if you want the cooler to double as a convenient backup station.

We tried out the ZM-NC2500Plus on a Dell Latitude E6400 laptop and were pleased to find that the cooler immediately dropped CPU core, GPU, and HDD temps by a few degrees, even under USB power and even with the laptop and cooler sitting atop an old (and very warm) desktop machine. (We really need to clean our desks around here.)

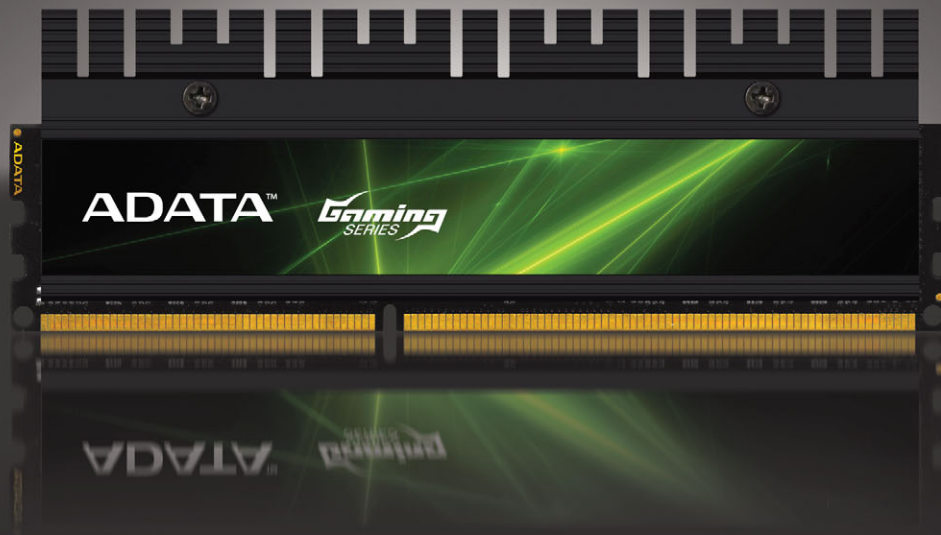
The ZM-NC2500Plus looks good, works well, and adds extra functionality to your setup. What's not to like? ▲

by Rod Scher

Specs: Dimensions: 2.55 x 12.36 x 15.35 inches (HxWxD); Input Voltage: 5V, USB powered; 3 USB ports; Fans: 2 50mm (1,700 to 2,250rpm); Drive bay: Hot-swappable 2.5-inch SATA (1.5Gbps/3Gbps)

ADATA XPG Gaming V2.0 Series DRAM Module

Fast & Stable



Within hardcore gaming, overclocking, and enthusiast circles, faster is always better. Unfortunately, though, faster tends to go hand in hand with hotter, which is not so good. ADATA's XPG Gaming V2.0 Series DRAM Module brings killer speed and related performance to component-conscious gamers in DDR3-1600, DDR3-2000, DDR3-2200, and DDR3-2400MHz frequency options. The company's approach of doubling up on the amount of copper it uses in the module's PCB, combined with the use of ADATA's TCT (Thermal Conductive Technology), brings gamers the stability and reliability needed to keep that speed from killing the gaming experience.

Thermally Speaking

Available in dual-channel (2GB x 2 and 4GB x 2) and triple-channel (2GB x 3 and 4GB x 3) kits, the XPG Gaming V2.0 Series DRAM Module's use of TCT means that each memory chip is put in direct contact with the module's aluminum heat spreaders. Further, the heat spreaders sport an extended surface area that leads to more efficient offloading of heat. The end result is that heat is immediately ushered away from those critical module areas where damage is likely to occur.

One aspect of TCT is ADATA's use of 2 ounces of high-quality copper in eight layers on the module's PCB, which gives the XPG Gaming V2.0 Series DRAM serious cooling capabilities and reduces electrical flow resistance to cut down on electrical waste. Overall, you're getting a module that offers better signal integrity and a longer lifespan.

Xtreme Plus Gaming

Optimized for 64-bit operating systems and sold with a limited lifetime warranty, the XPG Gaming V2.0 Series DRAM Module series includes the DDR3-2400G, DDR3-2200G, DDR3-2000G, and DDR3-1600G models, all of which are tested at latency settings of CL9-9-9-24 at 1.55V to 1.75V. Additionally, all are backward-compatible with DDR3-1600, DDR3-1333, and DDR3-1066 frequencies.

If you're a gaming enthusiast who requires the most out of your system components, the XPG Gaming V2.0 Series DRAM Module gives you the speed and performance you demand from system memory without sacrificing stability and reliability to get it. ■

Shuttle SX58J3

Cramping 12 CPU threads into an SFF box can be a big deal. Shuttle's SX58J3 takes the tried-and-true XPC theme and makes it fresh with an update to Intel's X58 chipset, including support for the Core i7-980X. With single-slot cards, the platform runs either ATI CrossFireX or Nvidia SLI, or you can fit one dual-slot card. We had Sparkle GeForce GTX 480 and GTX 470 cards on hand, but with the GTX 480, we had to crush the top-mounted 6- and 8-pin graphics power wiring to screw the drive cage back in. With the GTX 470, we applied far less pressure.

In every other way, the SX58J3 met or surpassed our expectations. We weren't surprised to only find a smattering of OC

profiles and relatively little tweaking capability in such a small system, although default profile lifted our CPU multiplier from 25X to 26X. Shuttle makes amends with twin Marvell 8057 Gigabit controllers, an eSATA power connector on the back panel, an 80 Plus Bronze-certified 500W PSU, and—most welcome of all—Mini-ITX compatibility for future motherboard upgrades. ▲

by William Van Winkle



SX58J3

\$599

Shuttle

us.shuttle.com



Specs: CPU Socket: LGA1366; Chipset: Intel X58/ICH10R; Max memory: 16GB DDR3-1600 (4 DIMMs); Audio: Realtek ALC888 7.1; Ports: 4 3Gbps SATA; 9 USB 2.0 (8 rear, 1 front), 1 eSATA; 1 USB/eSATA (shared), 2 Gigabit Ethernet; Slots: 2 PCI-E x16; PSU: 500W; Dimensions: 8.0 x 8.4 x 13.1 inches (HxWxD)

Test system specs: CPU: 3.33GHz Intel Core i7-980X; RAM: 4GB Mushkin Blackline DDR3-1600; GPU: Sparkle GeForce GTX 470; Storage: Mushkin Callisto 60GB; Windows 7 Ultimate 64-bit

Benchmark Results	Shuttle SX58J3
PCMark Vantage	18304
Memories	10948
TV and Movies	7172
Gaming	19962
Music	18499
Communications	16681
Productivity	20566
HDD	29255
Cinebench 11.5	8.58
POV-Ray 3.7a*	6,480pps
SiSoftware Sandra 2010	
CPU Arithmetic	
Dhrystone ALU (GIPS)	143
Whetstone (GFLOPS)	104
Processor Multi-Media	
Integer x16 iSSE4.2 (Mpixels/s)	268.71
Floating Point x8 iSSE3 (Mpixels/s)	201
Double x4 iSSE2 (Mpixels/s)	109.42
Memory Bandwidth	
Integer Buffered iSSE2 (GBps)	16
Floating-Point Buffered iSSE2 (GBps)	16
Resident Evil 5	
1,280 x 960, No AA	
Variable	188.9
Fixed	147.7
*pixels per second	

Netgear GS605AV

How does one innovate a basic 5-port switch? The GS605AV is one of Netgear's "green" products (meaning the ports adjust power draw based on cable length and presence), but the standout feature is the color-coded port priorities. Instead of sending users into esoteric menus to decipher application priorities, dark green, port 5, receives top priority (<10 ms latency and jitter, according to Netgear), port 4 assures <100 ms latency, on down to the yellow port 1, which Netgear recommends for "background" needs.

We ran a series of load tests to see if Netgear's QoS coding pays off in the real

world. We connected our Gigabit router to the switch's port 4 and a Gigabit NAS box into port 2, leaving the top, middle, and lowest ports free. With only copying a 1.7GB test file from the NAS to our Gigabit-enabled notebook client, we measured roughly 38MBps transfers regardless of which port—1, 3, or 5—we used. In the absence of competing traffic, Netgear treats all ports equally.

Then we added a 10/100-enabled notebook pulling a 1080p video through the switch via the Gigabit router. With our GbE notebook in port 5 (highest QoS) and the 1080p video streaming

through port 3, our 1.7GB file transfer jumped to 42.5MBps, apparently performing faster in port 5 with competing traffic than without it.

Stepping up the load further with a 480p Netflix stream through port 3 to our Xbox 360, our Gigabit notebook pulled 37.5MBps from port 5 and 32.5MBps from port 1. During these tests, our 10/100 notebook continued streaming 1080p video through ports 1 and 5, respectively.

The GS605AV's prioritization scheme clearly works. We observed a 10MBps difference between the highest and lowest ports under load, and different load scenarios should reveal similar benefits in latency reduction. For its simplicity, effectiveness, and reasonable price, we recommend the GS605AV for growing home LANs. ▲



GS605AV

\$49.99

Netgear

www.netgear.com

Specs: Ports: 5; Speeds: 10/100/1000Mbps Ethernet; Dimensions: 1.3 x 5.4 x 4.0 inches (HxWxD)

by William Van Winkle

CPU RANKING ○ ○ = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT



Puget Systems Serenity PC

Puget
systems

Puget Systems, a custom PC builder located in Auburn, Wash., can build just about any type of computer, including gaming rigs, workstations, servers, budget machines, and small form factor PCs. One of its intriguing products is the Serenity Silent PC.

Designed to be as quiet as possible, the Serenity PC boasts plenty of power but maintains a low noise profile. The Serenity is built with an Antec P183 case whose dual-chamber design isolates the PSU's heat from the other components. The door and side panels are built to cut sound with a triple-layer design that sandwiches a plastic polymer between two layers of aluminum, onto which Puget Systems adds yet another layer of acoustic dampening foam.

The oversized processor cooler is equipped with a 120mm PWM (Pulse Width Module) fan that adjusts the fan speed according to

the system's demands. Puget Systems also elected to use graphics cards with no fans, instead relying on larger heatsinks to cool the cards. (Higher powered graphics cards with fans are also available.) The Serenity PC also features noise-dampening hard drive enclosures, foam insulation that will absorb a tremendous amount of the sound, and carefully selected quiet fans.

As with all of Puget Systems' products, components and features of the Serenity PC are eminently customizable. The Serenity starts with an ASUS P7P55D-E Pro motherboard that can be paired with a number of processors, including Intel® Core™ i3, i5, and i7 processors. You can also select the amount of Kingston RAM you want in your system, from 2GB to 16GB. There are several possibilities for graphics cards, as well as a nice array of different sound cards,

controllers, and networking options. For storage, available hard drives run the gamut from 80GB Intel SSDs to 2TB Western Digital Caviar drives. If further customization is desired, Puget Systems encourages clients to call or email so that the quiet nature of the PC can be maintained.

With these high-performance PC options, Puget Systems is on the leading edge of quiet PC building. Their proper component selection, carefully planned case modding, thermal imaging, airflow testing, and rigorous quality control ensure that not only is the PC properly cooled, but that the cooling is highly optimized and does not create any excess noise.

Altogether, the Puget Systems Serenity PC offers a high level of customization and plenty of horsepower, all in silent package. ■

Able Planet True Fidelity NC300W

I'm in my early 40s, and for much of the last decade I've worn headphones roughly four-plus hours Monday through Friday. Add in countless rock shows since my teens, and I don't just suspect my hearing has taken a hit, I'm convinced of it. Such traits make me a good candidate for the Linx Audio technology Able Planet integrates in its NC300W and other headphones.

Linx Audio aims to enhance speech intelligibility for listeners with age-associated hearing loss without having to raise volume levels to do it. It does so by upping high-frequency harmonics and using soft-clipping to diminish distortion and squash harsh sounds. The effect was especially noticeable in hip-hop and other bass-laden tracks I passed through the NC300W, including Public Enemy's "Burn Hollywood Burn" and Metallica's "Seek & Destroy."

Public Enemy's "Fear Of A Black Planet," in fact, features scores of purposely audibly irritating bells, whistles, and other distortion-tinged samples meant to grab attention. Through the NC300W, the jarring sharpness of such effects softened while lyrics remained dynamic and distinctive. In live tracks from Wilco, The White Stripes, and Sigur Rós, meanwhile, mids and highs shined, though the bottom end fell out slightly. As Able Planet promises, however, the NC300W output louder audio at lower volume levels, at least in comparison to other NC headphones I compared the NC300W against.



True Fidelity NC300W

\$149.99

Able Planet

www.ableplanet.com

Comfort-wise, the headphones wear well over long durations thanks to their lightness and generous headband and ear cushioning. Style-wise, the white and gray color pattern my review unit sported stands out (also available in black) but may take on discoloration, smudges, and marks

over time. Otherwise, the 6-foot cord is removable and integrates a convenient in-line volume controller, while the earcups spin 90 degrees horizontally and about 30 degrees vertically.

If your hearing isn't what it used to be and affordable, quality NC cans reside on your must-have list, your ears will gladly welcome the NC300W. ▲

by **Blaine Flamig**

Specs: 20Hz to 20,000Hz frequency response; Sensitivity at 1kHz: 115dB (off) and 121dB (on); quarter-inch stereo and airplane adapters and hard shell protective carrying case included

Thermaltake Frio

Bigger doesn't always mean better, and if you've ever eyeballed some giant CPU cooler/heatsink and suspected that all that bluster and bling wouldn't necessarily translate into better performance, I'm right there with you. However, after testing the brick of a CPU cooler that is the Thermaltake Frio, my tune has changed somewhat.

The Frio is a big square of heat-dissipating aluminum fins with an aluminum and copper base and is sandwiched between two 120mm fans (one of which you can add or remove from the cooler at your pleasure). The design puts the fans in a "tower-side flow" configuration

instead of on top of the CPU, so it moves air in parallel with the case fans.

Billed as a good choice for overclockers, the Frio is really made for anyone who wants better CPU performance when running intensive tasks, such as gaming, but also requires flexibility in reducing noise, which is possible with the Frio's variable speed fan control (which adjusts from 1,200 to 2,500rpm). For better performance, you can crank the fans all the way to 11 (as it were), although they do get rather noisy at full tilt.

I overclocked the CPU from 3.2GHz to 3.84GHz with the Frio installed; with

a stock fan, the system maxed out at 3.76GHz. It's not a massive boost, but it's a nice bump from a \$59.99 cooler.

The Frio is compatible with Intel LGA775/1156/1366 and AMD AM2/2+/3 sockets, so it should work with both new and old systems. ▲

by **Seth Colaner**



Frio

\$59.99

Thermaltake

www.thermaltakeusa.com

Specs: Dimensions: 165 x 139 x 98mm (HxWxD); Weight: 1,042g; Noise: 20 to 43dBA; Fan speed: 1,200 to 2,500rpm; Materials: Base: copper and aluminum, Fins and Heatpipe: aluminum; Max airflow: 101.6cfm

Test system specs: CPU: AMD Phenom II X4 (3.2GHz); Motherboard: Gigabyte GA-890FXA-UD5; RAM: 2GB OCZ DDR3-1333; Graphics: ATI Radeon HD 5850; HDD: 150GB Western Digital Raptor 1500

Cooler Master HAF X

The HAF X is a case that's tailor-made for people who run SLI or Cross-FireX systems. For instance, there's an air duct that you install adjacent to the video cards that can hold a 120mm fan to create more air movement than what



the cards would receive from a front-panel fan(s).

The exterior of the HAF X is a matte black, and Cooler Master coated it so that the metal and plastic exterior pieces all feature the same color and texture. But if you're looking for flash and color, the base model HAF X isn't it. On the front panel, there are two USB 3.0 ports, two USB 2.0 ports, an eSATA port, a Fire-Wire port, and audio jacks. The HAF X includes a 230mm fan in the front chassis (with a switchable red LED) and over the hard drive cage, as well as a 200mm side-panel fan, a 200mm top fan, and a 140mm rear exhaust.

HAF X
\$199.99
Cooler Master
www.coolermaster.com

Specs: Dimensions: 23.2 x 9.1 x 21.7 inches (HxWxD); Motherboard compatibility: ATX, E-ATX, microATX; Bays: 6 5.25-inch external, 5 3.5-inch internal; Fans: 1 140mm exhaust, 1 230mm intake, 1 200mm top, 1 200mm side; Expansion slots: 9

For SSD storage, Cooler Master offers two 5.25-inch drive bays that each feature one set of 2.5-inch screw holes and a hot-swap backplane, so you easily switch SSDs in and out. We also like that Cooler Master locates several grommets with soft plastic openings all along the motherboard tray to make it easy to hide and route cables to the storage devices.

Cooler Master gives you almost 14 inches of space from the rear of the chassis to the hard drive cage to provide space for long graphics cards. Another helpful feature on the HAF X is the GPU holder, which is a heavy metal brace that screws into the rear chassis and holds up to two graphics cards in place, a lifesaver when you want to protect the graphics cards en route to a LAN party.

Cooler Master has definitely improved upon the HAF 932 by adding a number of features that are both helpful for performance and everyday use. ▲

by Nathan Lake

Aerocool F6XT

We've dedicated several reviews to Aerocool's line of fan controllers in the recent past. In all, we've looked at the Touch 1000, Touch 2000, and the VX12, each of which features a touchscreen, fan control, and temperature monitoring.

The F6XT, however, is a little different. Designed for the budget-conscious enthusiast with an uncomplicated taste, the F6XT's sole purpose is to control the speeds of six fans.

Measuring about 1.5 x 5.5 inches (HxW), the F6XT has a low-profile design that occupies only one drive bay. The plastic front panel features six fan labels, each with its own raised button. To the side of each fan button are three LEDs that light up to represent the current speed of each fan. Pressing a fan's button once, twice, or thrice will set the

F6XT
\$24.99
Aerocool
www.aerocool.us

fan low, medium, or high, respectively.

If aesthetics are a priority, the F6XT can alternate the LEDs' colors from red to blue when you press the center "Color" button. If the display distracts, you also have the option to turn the LEDs off with a third button-press.

We spent very little time installing the fan controller, as all we had to do was use the included screws to mount the F6XT in our case and then attach



our fans to the controller's connectors.

The F6XT held securely in place, so when we pressed any of its buttons, it didn't recede into the drive bay or rock back and forth.

Like all of the Aerocool fan controllers we've seen, the F6XT performed as well as we'd hoped. Its straightforward interface and low price make it the perfect choice for enthusiasts who simply want to be in charge of their case's cooling. ▲

by Kris Glaser Brambila

Specs: Display: Dual red and blue LED colors; Connectors: 6 4-pin Molex connectors; Max wattage per fan: 12W

V3 Gaming Move

If you've ever lugged a 40-pound, full-sized tower to a LAN party, you know how much easier it'd be to travel with a system that you can comfortably carry in one arm. V3 Gaming's Move is designed to fit the needs of LAN partygoers that need a lightweight system (11.58 pounds) that isn't short on performance.

The Move is built inside of a Silverstone Sugo SG05, and compared to previous Sugo models, the SG05 is around half the total size—measuring roughly 6.92 x 8.74 x 10.87 inches (HxWxD). The length of the SG05 allowed V3 Gaming to include an Nvidia GeForce GTX 460, and the graphics card's fan aligns directly with the mesh opening on the case's side panel. To help keep the processor's heat from affecting system components, V3 Gaming installed an Asetek LCLC with a 120mm radiator at the front of the case. The 120mm, 1,200rpm fan in the front chassis worked well enough that V3 Gaming was able to overclock the Intel Pentium G6950 dual-core processor from 2.8MHz to 3.6GHz.

V3 Gaming tells us that the Move is "GPU-optimized" in that the GPU costs twice as much as the system's processor. The Pentium G6950 is the most affordable Clarkdale processor, and even at 3.6GHz, the lack of Hyper-Threading, Turbo support, and VT-d mean the Move sent to us isn't going to blow away benchmark records. That being said, the Move still offers suitable gaming performance at

1,900 x 1,200, and the G6950 helps to keep the system affordable. Of course, V3 Gaming allows you to change the default configuration to a more feature-filled 1156 processor, if your budget allows.

The Move sent to us also featured 4GB of Patriot Viper II DDR3-1600 memory, a 320GB Western Digital Scorpio Black, and a 10X BD-ROM and 8X DVD-RW combo drive. The limited interior space offered V3 Gaming nowhere to hide the cables, but the builder did a good job of coupling the power and I/O cables to sides where the cables wouldn't block the passive airflow from the top and side mesh openings.

Portability comes at a performance cost, and even with a GeForce GTX 460, the Move could not produce 30fps with our test games set at 2,560 x 1,600. The good news is that bumping resolutions down to 1,920 x 1,080 gave us frame rates around 35 to 40fps, while 1,600 x 900 delivered 70 to 80fps. Benchmark results from our SiSoftware Sandra Lite tests showed that processor is the slow cog here, but V3 lets you configure the Move with any LGA1156 CPU. The 11.88GBps and 12GBps Memory Bandwidth scores were a little lower than we thought we'd see from 1,600MHz frequency memory.

When you consider the portability of the Move, it's certainly an appealing option for LAN party regulars. Its power may not be enough for pure performance enthusiasts, but you'll get the last laugh when it's time to pack up and take your PCs to the car. ▲

by Nathan Lake

Move
\$1,199 (as tested)
V3 Gaming
www.v3gamingpc.com
●●●●●



Specs: CPU: Intel Pentium G6940 @ 3.6GHz; GPU: Nvidia GeForce GTX 460; RAM: 4GB Patriot Viper II DDR3-1600; Motherboard: Zotac H55-ITX WiFi Mini-ITX; Storage: 320GB Western Digital Scorpio Black; PSU: Silverstone ST45SF Modular; OS: Windows 7 Ultimate 64-bit

Benchmark Results	V3 Gaming Move
3DMark Vantage	
Overall	10165
GPU Score	11540
GPU1 (fps)	35.59
GPU2 (fps)	31.96
CPU Score	7489
CPU1 (Plans/s)	1030.3
CPU2 (Steps/s)	10.08
PCMark Vantage Pro 1.0	
Overall	6183
Memories	5348
TV And Movies	3629
Gaming	5533
Music 6244	
Communications	6274
Productivity	5132
HDD	3418
SiSoft Sandra 2010 Lite	
<i>Processor Arithmetic</i>	
Dhrystone ALU (GIPS)	37.77
Whetstone iSSE3 (GFLOPS)	20.76
<i>Processor Multi-Media</i>	
Integer x16 iSSE4.2 (Mpixels/s)	63.65
Floating Point x8 iSSE3 (Mpixels/s)	59.9
Double x4 iSSE2 (Mpixels/s)	30.42
<i>Memory Bandwidth</i>	
Integer Buffered iSSE2 (GBps)	11.88
Floating-Point Buffered iSSE2 (GBps)	12
Cinebench 11.5	
CPU*	2.3
POV-Ray 3.7 Beta**	1780.28
Dirt 2 (8X MSAA)	7.2
FarCry 2 (8XAA)	26.18
S.T.A.L.K.E.R. Call Of Pripyat	5.8
* points	
** pixels per second	
Games tested at 2,560 x 1,600.	

CPU RANKING ○ ○ = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

PSU MYTHS

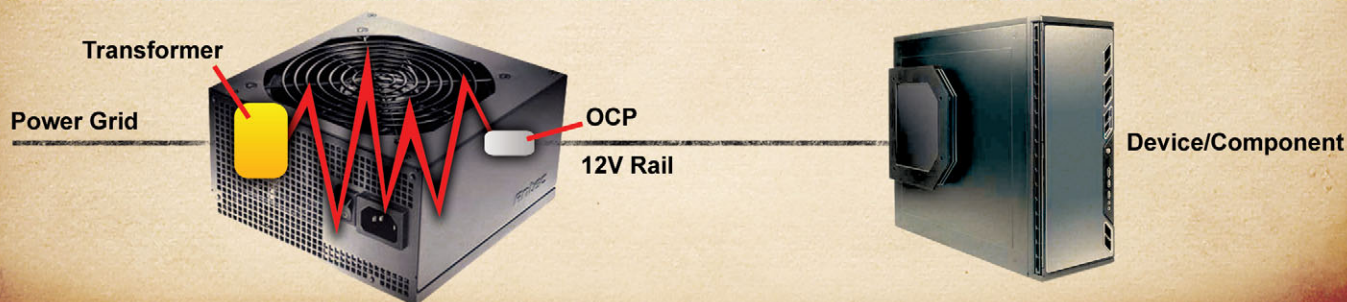
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MYTH 3: A Single-Rail Power Supply Is As Safe As Multi-Rail Power Supply!

NO! Single-rail power supplies do not come with over current protection (OCP) safety functionality on their +12V rails. OCP limits the amount of current that can pass through the PSU's rails (and into your PC) when it exceeds a threshold called the OCP set point. OCP is necessary because if you experience a short-circuit in your system (which is unfortunately possible, even with modern equipment and building techniques), OCP will cause the power supply to shut off, preventing excessive levels of current from flowing into your system and damaging the hardware attached to it.

A single-rail power supply cannot offer this safety feature due to high current flowing through only one rail. This means that in the event of a short-circuit or other hardware failure, up to 100A (100A x 12V = 1,000 watts!) of current flows unhindered into the system, damaging everything in its path. If the user is unlucky enough and happens to be acting as grounding at that exact moment, this could be even life-threatening. Are you sure you want to risk your safety installing an unsafe power supply like this?

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Intel LAN Fest

Mods Across America

Intel's excellent LAN Fest series of LAN events has kept us hopping this year, and we thought we'd take a few minutes to show off some of the cool stuff we've seen at several events in the past few months.



Intel LAN Fest InfernaLAN Spring 2010

Toward the end of April, we headed out to DuPont, Wash., for InfernaLAN, one of several well-established events in the Pacific Northwest that we try to attend each year. This year's mod contest winner, Stephen Popa, Jr., decided that he was tired of toting a full-sized PC into and out of LAN parties. His solution? Build a PC that could carry him into and out of LANs. Thus was born the Scooter 'Puter, an elegant weapon from a more civilized time.

Intel LAN Fest Sacramento 2010

The second weekend in May found us at Intel LAN Fest Sacramento at Intel's Folsom campus. Travis Parker, a guy who is no stranger to the modding scene, showed off this clear beauty, lovingly cut and assembled from the finest acrylic.

Intel LAN Fest Nor'Easter 2010

Nor'Easter's slogan is "the LAN taking New England by storm," and we won't argue that point with a 400-seat event like this one. The mod taking Nor'Easter by storm this year was Brian Smith's Guinness tribute/brewery mod. Nice work, Brian; we get thirsty just looking at this thing.

Intel LAN Fest New Mexico CureLAN 2010

Jeff Corley took the fair day goose at CureLAN 2010 in Rio Rancho, New Mexico. His mod is the epitome of portability, and as a result, efficiency and cooling expertise. Packing a full system's worth of components (including the LCD display) into an attaché case this slim required six precisely placed 70mm fans, but Corley got it done. Add a keyboard and mouse, and you can take this bad boy anywhere there's an outlet.

Intel LAN Fest DesertBash 9.0

We hit DesertBash 9.0 in Phoenix on June 26 and saw (among other wondrous things) Craig Anderson's uber-clean, uber-cool mod based on Cooler Master's CM Sniper platform. This is a mod that exudes an aura of raw horsepower, but thanks to little touches here and there, such as the ROG OC Controller looking right at home on the front panel, it's clear that Anderson has it under control.

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Phenom II X6 1090T Overclocking

When Intel released the first wave of Core 2 processors based on the Conroe core a few years ago and decisively reclaimed the CPU performance crown, enthusiasts started abandoning their once beloved AMD platforms in droves. Ever since the introduction of the first Slot A Athlon processors, AMD had often maintained a performance advantage over Intel's desktop processors. As such, AMD processors were the preferred choice of power users. But, we are a finicky bunch that likes to be on the bleeding edge of PC performance. Save for the die-hard fanboys out there, most power users go where the performance is, and when Conroe hit, that meant Intel.

The fact that Intel has a firm grip on the CPU performance crown at the ultra high end of the market has a cascading effect on other market segments. Even if a similarly priced AMD platform may offer performance on par with or possibly even better than an equivalent Intel product, enthusiasts seem more likely to choose Intel's offering. In an effort to combat this trend, AMD has been very aggressive with product pricing while also steadily improving upon its processor and platform as a

AMD's current lineup of Phenom II processors may not be able to outpace Intel's high-end offerings, but they do represent excellent values at their current price points. The sub-\$300 six-core Phenom II X6 1090T, for example, is able to keep pace with a Core i7-965 and, with a little overclocking, can even surpass the 965 with many workloads.



whole. This is important to note because the sheer value and relatively strong performance of AMD's latest offerings make them compelling alternatives.

Take the top-of-the-line Phenom II X6 1090T, for example. Currently priced under \$300, the 1090T is one of the most affordable six-core processors on the market; only the lower clocked 1050T is less expensive. Pair the Phenom II X6 1090T with a nice AMD 890FX-based motherboard and decent cooler, and you have the foundation of an incredibly powerful six-core system for a fraction of the price of a hexacore Intel processor (and even some Intel quad-cores).

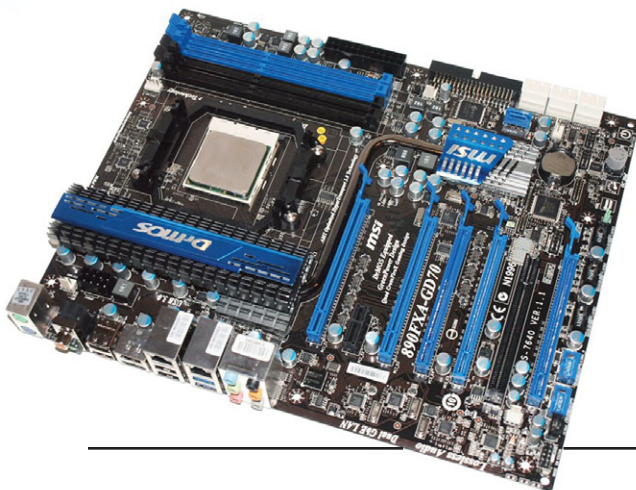
With the kind of value AMD is currently offering, we thought it was time to see just what the company's latest flagship

CPU could do with a bit of tweaking and overclocking. Modders are always on the lookout for great values, and if there's one thing in AMD's favor right now, it's the value proposition of its latest platform.

Tools Of The Trade

Due to the fact that AMD's current products emphasize value, we decided to take a conservative approach to this overclocking project. Sure, we could have matched a Phenom II X6 1090T with some LN₂ or a phase-change cooler and ratcheted clock speeds into the stratosphere, but, realistically, there aren't many users out there who are going to mate a sub-\$300 CPU with thousands of dollars of cooling equipment. With that in mind, we decided to stick with an inexpensive, relatively unassuming air cooler, albeit one that will perform better than a stock PIB heatsink. We also opted for a motherboard that fell on the lower end of the high-end price spectrum.

The cooler was an Arctic Cooling Freezer 64 Pro PWM (\$29), and the motherboard was MSI's 890FXA-GD70 (\$179). In addition to performing well and being priced right, the Freezer 64 Pro 92mm is also a relatively quiet cooler that can barely be heard above the noise generated by other system components. And the MSI 890FXA-GD70, while priced below some other enthusiast-class 890FX-based



AMD enthusiasts have a wide array of overclocker-friendly motherboards to choose from. We opted for a Socket AM3, 890FX-based board from MSI that features a host of overclocking tools. (It even has a dial on the board for simple HT overclocking on the fly.) Of course, users can overclock from within the system BIOS or using AMD's OverDrive utility from within Windows, as well.



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boards from Asus and Gigabyte, offers a host of overclocking features. The combination of features and competitive pricing of the cooler and mobo made them attractive options for this mod.

Phenomenal Mods

Overclocking AMD processors hasn't changed much over the years. AMD continues to offer unlocked Black Edition CPUs, so increasing the HyperTransport frequency is still an option. But with current Phenom II processors like the 3.2GHz X6 1090T, the addition of a feature called Turbo Core adds a new wrinkle.

Turbo Core bears similarities to Intel's Turbo Boost technology in that it automatically increases the frequency of three active CPU cores by up to 400MHz on the 1090T without the need for any special software or drivers, giving the Phenom II X6 1090T a peak Turbo Core frequency of 3.6GHz. Turbo Core technology works by putting up to three cores into a boost-enabled P-state when power consumption is below the processor's rated TDP. Being in the state doesn't necessarily mean the three cores are blindly overclocked by 400MHz immediately. Rather, they are ready to have their frequencies increased based on the processing workload. We should note that when Turbo Core is active, Cool'n'Quiet still functions as well, so each core could be operating at anywhere up to its maximum clock, but it doesn't necessarily have to.

The presence of Turbo Core means that X6 1090T overclockers must take the feature into consideration to ensure stability.

The new Turbo Core feature introduced with the Phenom II X6 adds an additional wrinkle to AMD overclocking. The max Turbo Core and CPU multipliers can be manipulated individually to strike a balance between maximum overclocked performance and perfect stability.

Current CPU Frequency	3.20GHz (200x16)	Help Item
Current DRAM Frequency	1066MHz	Specifies the CPU frequency multiplier.
Current CPU NB Frequency	2000MHz	
► CPU Specifications	[Press Enter]	
► CPU Feature	[Press Enter]	
AMD Cool'n'Quiet	[Auto]	
C1E Support	[Enabled]	
Adjust CPU FSB Frequency (MHz)	[200]	
OC Stepping	[Disabled]	
Adjust CPU Ratio	[x20]	
Adjusted CPU Frequency (MHz)	4000	
Adjust CPU-NB Ratio	[Auto]	
Adjusted CPU-NB Frequency (MHz)	2000	
AMD Turbo Core Technology	[Enabled]	
Adjust Turbo Core Ratio	[x20.5]	
Adjusted Turbo Core Freq. (MHz)	4100	
Unlock CPU Core	[Disabled]	
CPU Core Control	[Auto]	

Thankfully, the majority of enthusiast-class, Socket AM3 motherboards built around AMD's 8-Series chipsets give users the ability to alter both Turbo Core and standard CPU multipliers.

To find our Phenom II X6 1090T's peak overclock, we followed these steps. First and foremost, we ensured that our heatsink's base and the CPU's heat spreader were clean and polished and that we used a high-quality thermal paste. We also made sure our system's internals were neat and tidy and that our system's case fans were cooling the motherboard adequately. Then, we entered the system BIOS and disabled Turbo Core. We wanted to put the CPU under the maximum possible load while testing for stability and didn't want Turbo Core or Cool'n'Quiet altering frequencies during this process.

To perform the actual overclocking, however, we used the latest version of AMD's OverDrive utility and altered the CPU's multiplier and voltages from within Windows. The same options are available from within the system BIOS, but using OverDrive speeds the process by eliminating the need to reboot between changes (unless you push

things too far, of course). To overclock the Phenom II X6 1090T, we increased the CPU voltage by 0.1V to 1.56V and increased the other chipset and HT voltages by about 0.1V for good measure. (When you click Apply, OverDrive will shift the selected voltages up or down a notch.)

Then, we began increasing the CPU multiplier by 0.5X at a time and tested for stability using OverDrive's built-in tool. Ultimately, we found that a 21X multiplier pushed our particular 1090T to 4.2GHz while the Arctic Cooling Freezer 64 Pro kept temps below 70 degrees Celsius, but we did encounter some random instability. We ultimately had to back the clock down to 4.1GHz, at which point the system was perfectly stable.

At this point we could have stopped, but the availability of Turbo Core and Cool'n'Quiet means AMD overclockers don't always have to run their processors at peak frequencies. We decided to set the peak Turbo Core frequency to 4.1GHz and the standard clock to 4GHz to minimize the chance of instability with heavy multithreaded workloads. We also enabled Cool'n'Quiet. When we settled on these "final" settings, however, we made the changes via the system BIOS to eliminate the need to always launch OverDrive. Using OverDrive is still a perfectly viable option, of course, and it has the added benefit of being able to save profiles for easy switching.

Full Throttle

Overclocking AMD's latest Phenom II X6 processor produced excellent results. Obviously, performance increased across the board, which is always a good thing. But the increases also allowed the 1090T to perform

The AMD OverDrive utility gives users the ability to easily overclock their systems from within the Windows environment when using a compatible motherboard. OverDrive also lets users save profiles and switch between them, for those who prefer to employ different system settings for various scenarios.



much like, and sometimes better than, the more expensive Intel Core i7-965 Extreme. Had we tweaked further, massaging the HyperTransport and/or memory frequencies, or opted for an even more powerful

cooler, we likely could have unlocked even more performance from the 1090T.

Intel may have the fastest desktop processors available right now, but for the money, AMD has some very compelling

alternatives on the market that seem to be created with the modding community firmly in mind. ▲

by Marco Chiappetta

Phenom II X6 1090T Performance: Before & After The Mod

We used an assortment of popular synthetic and real-world application benchmarks to assess the performance of our overclocked Phenom II X6 1090T processor. In the chart, we have benchmark data recorded with the processor running with a stock base frequency of 3.2GHz and a stock Turbo Core frequency of 3.6GHz, and while overclocked to 4.0GHz (base) and 4.1GHz

(Turbo Core). We also threw in some scores from Intel's Core i7-965 Extreme processor for reference purposes.

Although AMD's processors can't quite keep pace with Intel's current offerings clock-for-clock, or core-for-core, the stock Phenom II X6 1090T offers up some very respectable scores that are in line with the more expensive Core i7-965. With the Phenom II X6 1090T

overclocked, however, its performance jumps significantly, beating the Core i7-965 handily in a few of the more processor-intensive tests such as Cinebench and POV-Ray.

In comparison to its stock performance, the overclocked Phenom's scores improved between 5.65% and 26.15%. We saw the largest gains with the highly parallel workloads, like those in Cinebench and

POV-Ray, and in the purely synthetic SiSoft Sandra Processor Arithmetic and Multimedia benchmarks. The encoding and gaming tests also showed solid gains. Note, however, that because we overclocked the Phenom II X6 1090T, which is an unlocked Black Edition processor, using multiplier manipulation alone, its memory bandwidth scores were essentially unchanged.

	Intel Core i7-965 Extreme @ 3.2GHz	AMD Phenom II X6 1090T @ 3.2GHz (base)/3.6GHz (Turbo)	AMD Phenom II X6 1090T @ 4.0GHz (base)/4.1GHz (Turbo)	Percent Increase (Mod vs. Stock)
Memory Frequency	1,066MHz	1,333MHz	1,333MHz	
SiSoft Sandra 2009 SP4				
Processor Arithmetic				
Dhrystone iSSE4.2 (GIPs)	85	67.75	81.21	19.8%
Whetstone iSSE3 (GFLOPs)	75	55.46	68.16	22.9%
Processor Multimedia				
Integer x8 iSSE4.1 (Mpixels/s)	149	224	265.6	18.6%
Floating Point x4 iSSE2 (Mpixels/s)	120	135.56	167.5	23.56%
Memory Bandwidth (MB/S)				
Integer Buffered iSSE2 (GBps)	18	12.83	12.87	0.3%
Floating Point Buffered iSSE2 (GBps)	18	12.8	12.84	0.3%
Futuremark 3DMark06				
CPU Benchmark	5,562	5,768	6,094	5.65%
LAME MT MP3 Encoding*				
Single-threaded	0:37	0:44	0:39	15.90%
Multithreaded	0:25	0:30	0:26	16.67%
Cinebench R11.5				
CPU Test	5.51	5.66	7.14	26.15%
POV-Ray (PPS)				
Multi-threaded	4,340	4,279	5,167	20.75%
Crysis SP Demo (FPS)				
CPU test (800 x 600, low quality)	179.85	121.61	146.34	20.34%

Test systems specs:

AMD: CPU: Phenom II X6 1090T; Motherboard: MSI 890FXA-GD70; GPU: GeForce GTX 280; Memory: 4GB (2x 2GB) Corsair DDR3-1600; HDD: WD Raptor 150GB HD; Windows 7 Ultimate x64

Intel: CPU: Core i7-965 Extreme Edition; Motherboard: Gigabyte EX58A-UD5; GPU: GeForce GTX 280; Memory: 6GB (3x 2GB) OCZ DDR3-1600; HDD: WD Raptor 150GB HD; Windows 7 Ultimate x64

*Results in (minutes:seconds), lower is better.

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08.05.10

Big Bang - Ottumwa, IA
www.warfactory.net

08.07.10

LANManiac - Brea, CA
www.lanmaniac.com

Max Damage Studios Summer LAN - Hilliard, OH
www.maxdamage.net
Rapid Response LAN party - Trenton, NJ
www.lanaddict.com/lan/view.php?LANID=2237 and
www.lanpartylist.com/list.php?cat_id=34

08.12.10

QuakeCon 2010 - Dallas, TX
quakecon.org

08.13.10

AELAN - North Vancouver, BC, Canada
coming soon

Carolina CON - Stokesdale, NC
www.ncgaming.com

DAMNLAN - Little Rock, WA
damnlan.net

GBLAN's Big Ol' LAN Party - Green Bay, WI
www.gblan.com

SuperCon-Colorado University - Denver, CO
www.supercon2k.com

08.14.10

LAN Lordz - Wichita, KS
lanlordz.net

WV Gamers - Eugene, OR
www.wvgamers.com

08.20.10

AWOL LAN - Eau Claire, WI
www.awollan.com

RTV CLAN Summer 2010 - Tyler, TX
www.rtvclan.net

08.21.10

BeezLAN - Tacoma, WA
www.beezlan.com

Iron Storm PURE - Pittsburgh, PA
pittco.org

NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com

Oklahoma Gamers Group - Oklahoma City, OK
www.okgg.org

SLAGG - Bradenton, FL
www.slagg.org

Spilled LAN - Statesville, NC
www.spilledlan.com

08.27.10

Overkill LAN Party - Tampa, FL
www.overkill-lan.com

PWNSTOCK 2010 - Blue Lake, CA
www.bluelakecasino.com/lan

08.28.10

pLAN - B - Livonia, MI
event.planbgaming.com

08.30.10

LAN Crypton - Whittier, CA
www.lancryption.com

09.03.10

GeekKon LAN - Middleton, WI
www.geekkon.net/gaming/lan.php
Little Rock GameCon - Little Rock, AR
littlerockgamecon.com
PAX West - Seattle, WA
www.paxsite.com

09.04.10

Rapid Response LAN party - Trenton, NJ
www.lanaddict.com/lan/view.php?LANID=2237 and
http://www.lanpartylist.com/list.php?cat_id=34

09.11.10

LAN Lordz - Wichita, KS
lanlordz.net

LAN OC V7.0 - Ohio City, OH
lanoc.org

WV Gamers - Eugene, OR
www.wvgamers.com

09.18.10

LANified 7: Down Right Fierce - Calgary, AB, Canada
www.lanified.com/events/details/4

NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com

Oklahoma Gamers Group - Oklahoma City, OK
www.okgg.org

SLAGG - Bradenton, FL
www.slagg.org

09.25.10

Sparty LAN Party - East Lansing, MI
www.spartylanparty.com

Triangle Gaming - Cary, NC
trianglegaming.com/liveseries/general

09.26.10

Frag for Cancer - Halifax, NS, Canada
www.fragforcancer.ca

10.02.10

Rapid Response LAN party - Trenton, NJ
www.lanaddict.com/lan/view.php?LANID=2237 and
www.lanpartylist.com/list.php?cat_id=34

10.09.10

LAN Lordz - Wichita, KS
lanlordz.net

10.16.10

SLAGG - Bradenton, FL
www.slagg.org

TigerLAN 22 - Hays, KS
tigerlan.net

10.23.10

BHN of Tampa LAN 2010 - Largo, FL
tampa.bhngaming.com/lan

Ham LAN - Hamilton, OH
www.ham-lan.com

Oklahoma Gamers Group - Oklahoma City, OK
www.okgg.org

WV Gamers - Eugene, OR
www.wvgamers.com

11.05.10

UberCon XIII - Edison, NJ
www.ubercon.com

11.06.10

Aggro LAN - Cuyahoga Falls, OH
www.aggrolan.com

Rapid Response LAN party - Trenton, NJ
www.lanaddict.com/lan/view.php?LANID=2237 and
www.lanpartylist.com/list.php?cat_id=34

11.10.10

LAN Lordz - Wichita, KS
lanlordz.net

11.20.10

Oklahoma Gamers Group - Oklahoma City, OK
www.okgg.org

SLAGG - Bradenton, FL
www.slagg.org

WV Gamers - Eugene, OR
www.wvgamers.com

11.26.10

Black FragDay - Waverly, TN
www.lanpartymap.com/tennessee-lan-party/1554-Completely-Reborn.html

12.03.10

Maryland LAN Gamers - Maryland
www.marylandlangamers.net

12.04.10

Rapid Response LAN party - Trenton, NJ
www.lanaddict.com/lan/view.php?LANID=2237 and
www.lanpartylist.com/list.php?cat_id=34

12.11.10

LAN Lordz - Wichita, KS
lanlordz.net

12.18.10

Oklahoma Gamers Group - Oklahoma City, OK
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For our full list of upcoming events,

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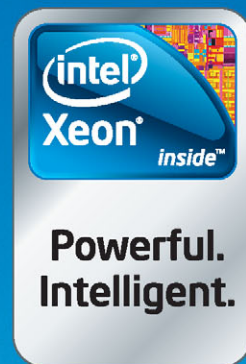
www.computerpoweruser.com/LanYard.

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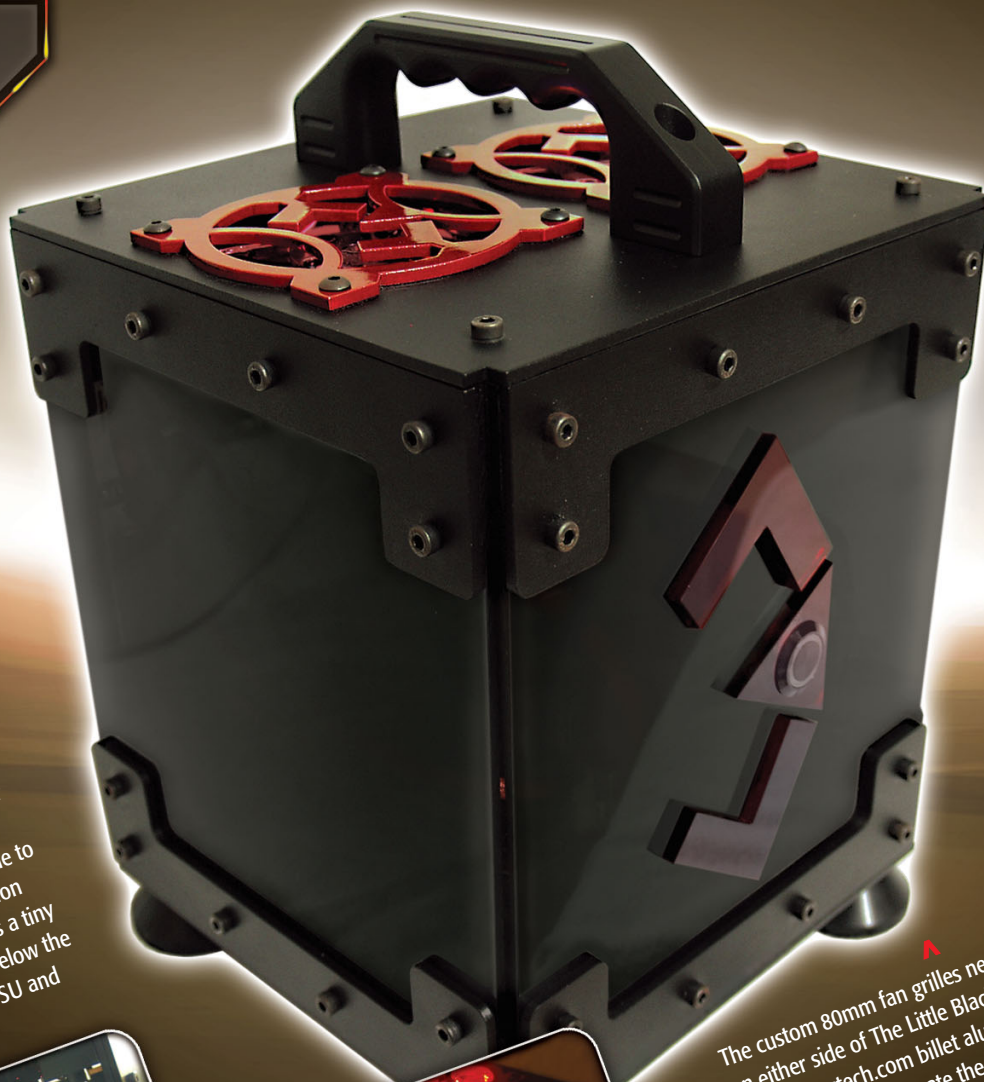
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Mad Reader *MOD*



Vanderhulst made good use of his case's limited interior space, which leaves just enough room on one side to accommodate his Radeon HD 5670 and provides a tiny but sufficient nook below the mobo tray for his PSU and Corsair SSD.



The custom 80mm fan grilles nestled on either side of The Little Black Box's Mnpctech.com billet aluminum case handle incorporate the stylized number 3 that makes up his clan's 3rd Dawn logo, matching the one he cut from acrylic and fastened to the front panel.



This case may be small, but Vanderhulst made sure you'll notice it at the next PDXLAN, even when the lights go down.

When Rick “Pixels” Vanderhulst set out to build The Little Black Box, his initial priority was to build a suitable HTPC to take back to college. As most CPU readers know, however, building a small form factor home-theater PC doesn’t mean you have to compromise where gaming performance is concerned, and before the design and planning phase was over, Vanderhulst’s project included a black Mnpctech .com Billet Case Handle for LAN party-style portability and a custom acrylic logo representing his gaming clan, 3rd Dawn.

Vanderhulst is working on a degree in mechanical engineering and has access to SolidWorks, which made taking his design from initial concept to fleshed-out 3D plan easier than it probably is for some. But don’t think that means The Little Black Box was done in a snap; Vanderhulst says the process extended over most of an eight-month period from concept to completion.

The case is a Vanderhulst custom creation, from the motherboard tray to the smoked acrylic side panels and its metal top and

bottom plates and side brackets. Another 3rd Dawn member designed the top-facing fan grilles, and Vanderhulst went to Mnpctech .com for the aforementioned handle and the case’s billet machined aluminum case feet.

Cooling is always a concern in cases of this size, so Vanderhulst set two 80mm Enermax Apollish fans in the top plate and vented the bottom plate to allow the Athena 300W PSU to breathe and for cooler air to enter the system and circulate upward. He also slapped a Thermolab Nano Silencer on The Little Black Box’s Intel Core 2 Quad Q8300.

Other components include a Zotac GeForce 9300 Wi-Fi Mini-ITX

motherboard, 4GB of Crucial Ballistix Tracer DDR2, a Radeon HD 5670 1GB GDDR5 video card, and a 64GB Corsair SSD.

Vanderhulst says The Little Black Box turned out exactly the way he wanted it to, and he’s digging having a LAN box that he can stuff in a carry-on bag. We’re guessing it will be present and accounted for at the next few PDXLAN events—at least until his next project is done. ▲



Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermad@cpumag.com. If we include your system in our “Mad Reader Mod” section, we’ll send you \$1,500 and a one-year subscription to *CPU*.

Did we mention that we found Vanderhulst's Little Black Box mod at PDXLAN 16? Well, we did. And, as you might expect, based on past coverage, it wasn't the only mod at the LAN. Generally speaking, the mods that make it into the Top Five for our mod contests at PDX are special, both in terms of their artistic merit and the craftsmanship that goes into them. This year's event was no exception, so without further ado, here are the Top Five mods from PDXLAN 16. (Photos courtesy of Rod Rosenberg.) ▲



The Champ: Another shot of The Little Black Box, with modder Rick Vanderhulst.



Runner-Up: You may recall the name Josh Sniffen. He's back and right in the thick of things with his latest mod.



Third Place: Steven Smith and his clear acrylic Danger Den monster, watercooled and ready to rumble.



Fourth Place: Bren Leach (another familiar name, no?) with yet another excellent mod.



Fifth Place: Stephen Popa, Jr. (check out his scooter mod in the very next article) rounded out the Top Five with this very Zen machine.

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- Exclusive software needs to be installed on a computer.
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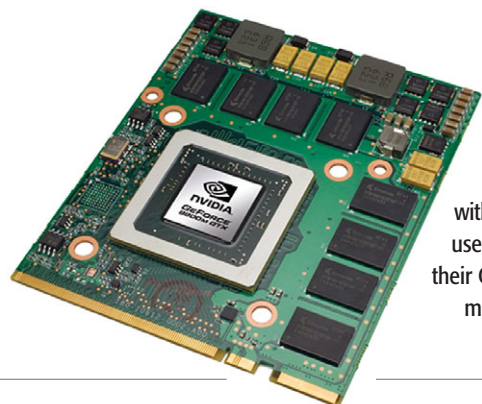
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Each month we dig deep into the CPU mailbag in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable? CPU's "Advanced Q&A Corner" is here for you.

Chris M. asked: I have owned an Alienware m15x for several years now. It has been, frankly, a love-hate relationship from the get-go. It has spent more time being in for repair than it has on my desk, and nearly every component has been replaced more than once—the primary culprit being failed GPUs. I am, to date, on my sixth Nvidia 8800M GTX, but as of today it is working just fine. However, my extended warranty is about to expire, so in a month or so I am going to be on my own with what can only be described as the Hyundai Pony of laptops.

Alienware offers two GPU choices for my model of laptop, the 8800M GTX as well as an ATI Mobility Radeon HD 3870. I have been doing a bit of research and have found that both of these GPUs, as well as several others, use the same MXM (Mobile PCI-E Module) format and are thus interchangeable. At least in theory they are.

Given that I can expect my current GPU to fail, what recommendations can you give me for an alternative GPU? The Mobility Radeon HD 3870 seems a little too yesterday, and I'd rather not fork out my own money to replace yet another 8800M GTX. I have seen some Radeon HD 5800 and 4800 series GPUs on eBay but wonder about compatibility.



Many notebooks with discrete graphics use MXM modules for their GPUs. Not all MXM modules are created equal, however.

Assuming the form factor is the same, should they work with the existing cooler, or can I expect extreme temperatures from the newer hardware that would overwhelm the stock cooler? Have there been sufficient improvements in thermal management with the newer chips to negate the problem? Any advice would be greatly appreciated.

A: You are correct in your assumption that MXM modules of the same type are technically interchangeable, but there are a few things to look out for. The Alienware m15x uses second-generation MXM 3 modules. And the GeForce 8800M GTX included within it has a 256-bit memory interface and a TDP of 37W. That means it must be using an MXM-B module. MXM-B modules are 82 x 105mm (LxW) and support 256-bit memory interfaces with a max power of 75W. Conversely, MXM-A modules are only 70mm long (they are the same width), support 64- or 128-bit memory interfaces, with a maximum board power of 35W. When shopping for a new MXM card for your notebook, be sure it conforms to the MXM-B spec, and you can rest assured that the new card will fit into your m15x. Although, as you pointed out, that's only half the battle.

The question of cooling still remains, however. Just because an MXM card will fit in a particular notebook doesn't necessarily mean that the notebook's cooling will be able to cool the new GPU adequately. Because the GeForce 8800M GTX has a TDP of only 37W, which is way below the maximum that an MXM-B module supports, Alienware may have engineered your m15x's cooling to support GPUs that fall roughly within the same power envelope. That said, even the Mobility Radeon HD 5870, currently ATI's most powerful mobile GPU, has a TDP of only 50W.

If you found a Mobility Radeon HD 5870 MXM module and wanted to give it a shot, it would most likely work. Worst-case scenario, if you found that the GPU was running a bit hot or that your GPU cooling fan was constantly running at its maximum, you could always underclock the GPU and graphics memory a bit to bring its power consumption down.

Tim B. asked: I'm an avid PC gamer and have a full custom Intel Core i7-based computer that I built from scratch. It has dual graphics cards (Radeon HD 5850s), terabytes of storage, 6GB of RAM—the works. My primary rig serves all my needs, including work tasks, multimedia, entertainment, and gaming, but, of course, it's also basically chained down to a desk in my office.

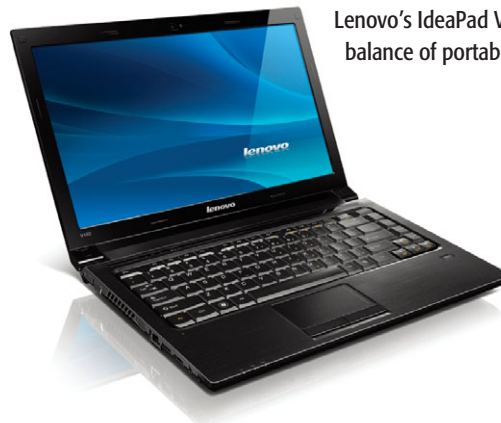
I'd like a light-duty machine that I can surf the Web on, check email, and perform some quick tasks like Photoshop and maybe an online video stream or two from Hulu, YouTube, etc. It doesn't need to have a huge screen, but I do care about a good balance of battery life and performance. Netbooks seem like all the rage lately, but I can't imagine an

Intel Atom processor will cut the mustard for me. I don't need to game on the notebook because I have my main rig for that, but I guess I need a "tweener" sort of machine. Any suggestion on what type of notebook platforms and brands I should be considering for what I want to do?

A: It seems that the thin and light notebook space is growing more crowded every day, and the good news is that these machines are becoming more powerful while still maintaining good battery life. This past year, Intel has released Core i3 and i5 chips targeted at notebooks. The beauty of these processor series is that they incorporate integrated graphics right on the CPU module. The processor itself is based on Intel's new 32nm manufacturing process (the on-chip graphics core component is 45nm technology), and with Intel's aggressive clock gating techniques and Turbo Boost (on Core i5 CPUs) for per-core dynamic overclocking, you get performance when you need it and low power consumption when you don't. If your most strenuous task will be streaming a bit of HD video, then one of these machines will take care of business nicely for you.

Lenovo's IdeaPad V460 is a 14-inch machine that, at press time, comes equipped with a dual-core 2.4GHz Core i5 and weighs in under 5 pounds. With 4GB of RAM and a 500GB hard drive, you'd have all the horsepower you'd need for the usage model you described.

Another option, if you wanted something even thinner and lighter, would be to look at an Intel CULV (Consumer Ultra



Lenovo's IdeaPad V460 offers a good balance of portability, performance, and battery life.

Low Voltage) processor-based machine. These are based on Intel's Core 2 architecture but have even lower power consumption. Here, you should easily realize at least five hours of battery life with a machine such as Asus' UL30A. This type of machine could handle HD video with ease, but it won't have the same peak performance as Lenovo's V460. ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com.

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Budget Systems From Both Camps

“**C**heap & Cheerful” is a desktop segment most *CPU* readers cheerfully ignore. That is, until we need to build something inexpensive for our kids or parents.

On an unlimited budget, it's easy to pick out PC parts because you probably already know which components are the best available. The low end is a lot more crowded. Sifting through page after Web page of budget parts—all of which have unfamiliar model numbers mere dollars apart—can be a bewildering experience.

Newegg wants to lend a hand. As a point of reference (two, in fact), the e-tailer demonstrates just what \$800 and \$400 will get you at press time.

This mainstream Intel rig and entry-level AMD system are both dual-core PCs with integrated graphics. These builds don't include keyboards, mice, monitors, or OSes.

Intel PC

A Core i5 and Blu-ray—that's the takeaway from this surprisingly capable Intel/Gigabyte collaboration. More than just a workhorse, it's an audiovisual entertainment hub.

Case. Sporting large fans fore, aft, and topside times two, Lian Li's Lancool PC-K62 steel case wouldn't balk even at some sort of Fermi/Prescott/nForce mashup. Eight expansion slots and coolant hose sphincters hint at the power potential here.

Motherboard. The GA-H57M-USB3 is a tiny mATX board that nevertheless manages enough full-length PCI-E slots

for CrossFireX support, albeit at reduced data rates. USB 3.0 and 3Gbps eSATA support, eight-channel HD audio (with optical SPDIF and Dolby Home Theater), and Gigabyte's over-clockable sturdiness come standard.

Processor. Intel's 32nm Clarkdale i5-661 is a 3.33GHz wunderkind that won't blitz your wallet. Hyper-Threading support makes it a dual-core that can act like a quad-core.

Graphics. Built into the Core i5-661 processor is Intel HD Graphics, which, as our testing shows, is not a contradiction in terms. A hardcore GPU this is not, but it covers your high-def video and casual gaming needs. Oh, and if it's a monitor or HDTV, this system can drive it. DisplayPort, HDMI, DVI-D, and D-Sub are all present and accounted for on the back panel.

Memory. G.Skill's reputation continues to grow. This DDR3-1600 set (F3-12800CL9D-4GBRL) runs at 1.5V with 9-9-9-24 timings. And could the Ripjaws' heat spreaders look any meaner?

Optical Drive & Hard Drive. LG's Blu-ray combo drive lets you read and write DVDs and CDs without dropping another C-note for BD-RE capability. And today's 1.5TB Seagate Barracuda 7200.11 is a trustworthy, high-capacity value.

AMD PC

Costing roughly half as much as the Intel build above, this Athlon II system nevertheless manages to supply two-thirds of the performance in certain tasks. Let's see what makes this low-priced pluggin' tick.

Case. No frills here. Rosewill's R218-P-BK gets the job done with economy. A



Despite the humble price point of Newegg's Intel build, its Lian Li case is proud and assertive.



Anchored by an 80 Plus Bronze-rated Rosewill power supply, this Core i5 rig will continue to save you money for the long haul.

Benchmark Results		Intel PC	AMD PC
Win7 x64		BIOS F7	BIOS 0906
3DMark Vantage			
Overall	E4696	E2270	
GPU Score	3996	1940	
GPU1 (fps)	13.35	4.46	
GPU2 (fps)	10	6.95	
CPU Score	9897	4638	
CPU1 (Plans/s)	1371.07	581.74	
CPU2 (Steps/s)	13.08	7.66	
PCMark Vantage Pro 1.0			
Overall	8730	4432	
Memories	4355	2405	
TV And Movies	4601	2823	
Gaming	4611	3052	
Music	7152	4956	
Communications	11847	5326	
Productivity	7429	4194	
HDD	4956	3408	
SiSoft Sandra 2010 Lite			
Processor Arithmetic			
Dhrystone ALU (GIPS)	51	20.3	
Whetstone iSSE3 (GFLOPS)	33	16.8	
Processor Multi-Media			
Integer x16	92.8	66.65	
iSSE4.2 (Mpixels/s)			
Floating Point x8	69.76	41.23	
iSSE3 (Mpixels/s)			
Double x4	37.9	22.6	
iSSE2 (Mpixels/s)			
Memory Bandwidth			
Integer Buffered	11.7	8.11	
iSSE2 (GBps)			
Floating-Point Buffered	11.72	8	
iSSE2 (GBps)			
Cinebench 10			
Score	11043	6278	
Time*	1:20	2:20	
Cinebench 11.5			
CPU**	2.89	1.67	
POV-Ray 3.7 Beta***			
	2263.18	1405.49	
* minutes: seconds			
** points			
*** pixels per second			

Intel PC

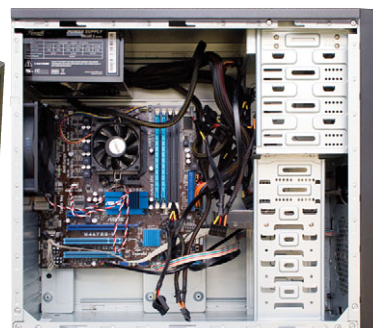
Part	Newegg Item #	Rating	Price	Shipping	Total
Lian Li Lancool PC-K62	N82E16811112239	5 (221)	\$99.99	\$2.99	\$102.98
Intel Core i5 661 3.33GHz	N82E16819115217	4 (29)	\$209.99	0	\$209.99
Gigabyte GA-H57M-USB3	N82E16813128430	4 (26)	\$119.99	\$7.56	\$127.55
G.Skill Ripjaws F3-12800CL9D-4GBRL, 4GB (2x2GB), DDR3-1600	N82E16820231277	5 (661)	\$97.99	0	\$97.99
Seagate Barracuda 7200.11 1.5TB, ST31500341AS	N82E16822148337	3 (2194)	\$79.99	0	\$79.99
LG UH10LS20 BD-ROM/DVD-RW retail	N82E16827136185	4 (9)	\$114.99	0	\$114.99
Rosewill Green RG700-S12 700W	N82E16817182191	3 (73)	\$74.99	\$5.99	\$80.98
Total					\$814.47

AMD PC

Part	Newegg Item #	Rating	Price	Shipping	Total
Rosewill R218-P-BK	N82E16811147073	4 (226)	\$29.99	\$14.99	\$44.98
AMD Athlon II X2 245 2.9GHz	N82E16819103687	5 (213)	\$58.99	0	\$58.99
Asus M4A785-M	N82E16813131595	4 (429)	\$69.99	0	\$69.99
G.Skill F2-8500CL5D-4GBPK, 4GB (2x2GB), DDR2-1066	N82E16820231166	4 (2208)	\$99.99	0	\$99.99
WD Caviar Green 800GB, WD8000AARS	N82E16822136517	4 (32)	\$74.99	0	\$74.99
Lite-On iHAS424-98 DVD-RW	N82E16827106335	5 (277)	\$25.99	0	\$25.99
Rosewill RV2-600 600W	N82E16817182039	3 (53)	\$49.99	\$1.99	\$51.98
Total					\$426.91



In spotlight drag-racing terms, this unprepossessing AMD system would be known as a sleeper.



From productivity apps to browsing, from high-def video files to DVDs, this stalwart Athlon II X2 PC proves that "entry-level" doesn't mean what it used to.

single 120mm fan and a CPU duct easily handle basic cooling needs.

Motherboard. ASUS steps up with the M4A785-M. Even AM3 chips are welcome on this DDR2 board, which is a feather in AMD partisans' caps. There's HDMI, eight-channel surround sound, and optical audio for A/V duties. ASUS' Turbo Key lets you turn the PC's power button into an OC switch, while its Express Gate environment rapidly puts you online or on Skype without waiting for the OS to load.

Processor. Twin 2.9GHz cores power this budget troupier from AMD. The Athlon II X2 245 acquits itself well in the Core i5's shadow, and does so at less than a third of the price.

Graphics. The G in the 785G north-bridge stands for graphics. ATI's Radeon HD 4200 shares system memory for your browsing and entertainment. Video, yes; video games, no.

Memory. Newegg once again turns to value innovator G.Skill with 4GB of

DDR2-1066 (F2-8500CL5D-4GBPK). This pair of DIMMs runs at 5-5-5-15.

Optical Drive & Hard Drive. It's back to basics with a speedy Lite-On DVD-RW and a 5,400rpm WD storage tank. Just between us, a \$79 SSD boot drive would sincerely pep up this PC and still barely crack the \$500 mark. ▲

by Marty Sems

WiMAX Updates

Improved Speed, Reliability For 4G Networks

As pilots accelerate their aircraft and turn sharply, they experience ever-increasing g-forces. As the forces speed past 3G and 4G, pilots need special training and g-suits to avoid health problems.

With the speed at which mobile data networks are changing, customers might feel like they also need some specialized training to handle all of the changes. Fortunately, the vendors behind the changes are working to keep things as simple as possible for their customers.

Mobile WiMAX networks, often referred to as “4G” networks, are gaining in popularity and availability worldwide. 4G is a fourth-generation standard for cellular and wireless data networks. Mobile WiMAX is based on the 802.16e standard, as established by IEEE.

Even though 4G is in its early stages, plans are already underway for improvements to the Mobile WiMAX standards. The recent announcement of the finalization of standards for 802.16e-Enhanced, as well as recent discussions on future plans for implementation of the 802.16m

standard, means major improvements are on the way for Mobile WiMAX/4G.

WiMAX Explained

WiMAX (short for Worldwide Interoperability for Microwave Access) is a wireless broadband technology specially suited for creating WANs (wide-area networks).

WiMAX specifications are spelled out under the IEEE’s 802.16 standard, in much the same way IEEE 802.11 contains the governing specs for all Wi-Fi variants. These specifications are the

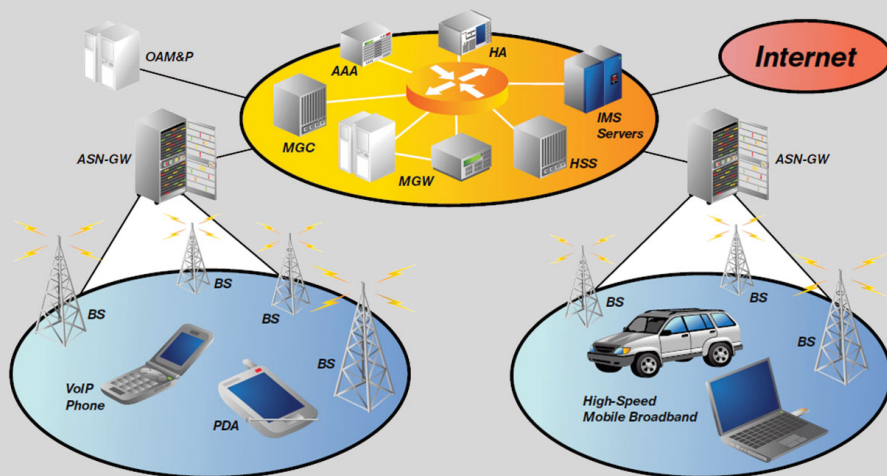
The Mobile WiMAX Network Components

Four major components make up a Mobile WiMAX (or 4G) network.

Mobile Switching Center. Think of the mobile switching center as the main hub of the Mobile WiMAX network that serves a city. The OAM&P (Operations, Administration, Maintenance, and Provisioning) system interfaces with the other components of the mobile switching center. To connect with other users in other cities, the mobile switching centers are connected to each other through a signaling network. The mobile switching center also provides access to the Internet.

The other components of the mobile switching center are: AAA (Authentication, Authorization, and Accounting) servers; ASN-GWs (Access Service Node Gateways); HAs (Home Agents); HSSes (Home Subscriber Servers); IMS (IP Multimedia Subsystem) servers; MGCs (Media Gateway Controllers); and MGWs (Media Gateways).

Backhaul Network. The backhaul network is the portion of the Mobile WiMAX that



links base stations (also called cell towers) with the ASN-GW and mobile switching center. The backhaul network is sometimes called the “invisible” portion of the network, because of its wireless nature and because it doesn’t require several specialized hardware components as does the mobile switching center.

Base Stations. These towers are the visible parts of the Mobile WiMAX network that allow the mobile users to make the connections

to each other and to the Internet. Each base station (BS) is made up of antennas and radio transmission hardware, and each one carries a variety of frequencies.

Mobile Devices. The users’ mobile devices make up the final component of the Mobile WiMAX network. The 4G/Mobile WiMAX network can carry more data than other types of cellular networks, enabling more efficient use of laptops, smartphones, and other complex handheld devices across the network.

Source: Sprint



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guidelines used by companies that manufacture, install, and service WiMAX equipment to ensure functionality and compatibility. The WiMAX Forum is an industry consortium that promotes WiMAX technology, and whose WiMAX Forum Certified program guarantees the interoperability of WiMAX-compliant equipment from various manufacturers.

WiMAX can operate on both licensed and non-licensed frequencies, which helps minimize problems with interference. In addition, companies can offer WiMAX systems in a regulated environment by licensing certain frequencies.

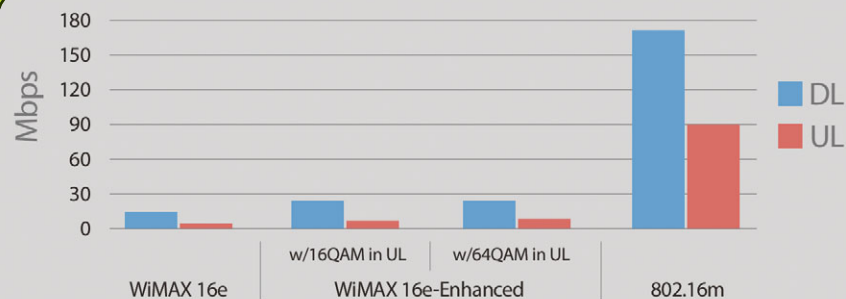
Enhanced Mobile WiMAX Introduced

Plans continue to move forward among Mobile WiMAX vendors for the upcoming 802.16e-Enhanced standard, proposed by the WiMAX Forum in June. The updated standard should provide better performance and capacity for Mobile WiMAX, up to a potential doubling of peak data rates.

During the announcement of the agreement on the enhanced Mobile WiMAX proposal, Ron Marquardt, vice president of technology for Clearwire, one of the leading Mobile WiMAX service providers, pointed out that his company's average 4G customers are using more than 7GB of data per month.

"We're committed to constant innovation, and these enhancements to the 802.16e standard will increase our ability to meet the incredible demand for super fast mobile Internet, both at home and on the go," Marquardt said.

The enhancements will be achieved through software upgrades for WiMAX-enabled devices, and potentially through some hardware additions, such as the installation of more antennas at base stations. The changes you'll find in 802.16e-Enhanced include:



802.16e-Enhanced, 802.16m Speeds Compared

Following the release of 802.16e-Enhanced, the next step for Mobile WiMAX will be the IEEE 802.16m standard, expected for a 2012 deployment. The enhanced 802.16e should ease the transition into 802.16m, which is sometimes called WiMAX Release 2. The standards for 802.16m should be finalized by early 2011.

Intel, one of the leading companies behind the 802.16m standard, has revealed that the new Mobile WiMAX standard is expected to allow download/downlink speeds up to 170Mbps and upload/uplink speeds up to 90Mbps for mobile devices. The 802.16m standard should be fully backward-compatible with 802.16e hardware.

The average peak user rates for mobile devices with current 802.16e networks (called WiMAX 16e in this graphic) are about 14.5Mbps for download rates and 3.8Mbps for upload rates. With enhanced 802.16e (called WiMAX 16e-Enhanced in this graphic), peak user data rates could double to about 28Mbps for downloading and about 5Mbps or 7Mbps for uploading. The slightly slower upload speed occurs at 16QAM (quadrature amplitude modulation), while the faster upload speed occurs at 64QAM. QAM is the modulation scheme used in digital telecommunications systems.

Source: Intel (with technical contributions from Alvarion, Beceem, Clearwire, Hitachi, Huawei, Motorola, NEC, Samsung, UQ, and ZTE)

- Increased performance for Mobile WiMAX devices that are located at the edges of a WiMAX cell.
- Increased coverage for the service provider of any given cell.
- Up to 70% improved spectral efficiency. (Spectral efficiency refers to the rate at which data can be transmitted over a given bandwidth in a communications network.)
- A potential doubling of peak data rates.
- A reduction of signal interference both within cells and among neighboring cell sites.
- Certified products for the new Mobile WiMAX enhancements should appear in 2011.

Accelerating Toward 4G

Mobile WiMAX/4G networks don't have quite the hardware installation numbers as other cellular phone standards, such as 3G LTE (Long Term Evolution), which is a pre-4G technology. Such 3G cell phone networks are installed in large

numbers around the world, while Mobile WiMAX/4G networks are still in the growth phase. The Mobile WiMAX enhancements and future improvements (such as with 802.16m) should give Mobile WiMAX a significant advantage in upload and download speeds over current cell networks.

Eventually, Mobile WiMAX could change the way people use the Internet similarly to the way cellular phone networks changed the way people use telephones. Mobile WiMAX could allow people to remain connected to the Internet at all times, bringing high-speed data transmissions and wireless Internet everywhere.

With the backward compatibility that will be built into 802.16e-Enhanced and 802.16m, the good news for 4G customers is they won't need specialized hardware or training to make use of the improvements. Pilots wish they had it so easy at 4G. ▲

by Kyle Schurman

White Paper: SeaMicro SM10000

Web Servers Enter The Atomic Age

Microprocessor manufacturers continue to push the envelope, developing faster and faster chips. High-end chips are important for complex software and 3D gaming.

Sometimes, though, you don't need the latest and the greatest to perform your tasks. Sometimes, an older architecture is fast enough.

SeaMicro believes it has found a "fast enough" chip in Intel's Atom CPU, a chip that may change the way certain Web servers operate. With SeaMicro's SM10000 server, hundreds of Atom CPUs combine to deliver the kind of

performance that works well for some popular Web-based applications, while conserving power and space, two areas where data centers and servers traditionally have not performed well.

Fast Enough

Smaller, less powerful chips, such as Intel's Atom, have already proven their worth in netbooks and smartphones. Such chips are power-efficient while delivering enough performance to perform tasks common to such devices.

According to CEO and co-founder of SeaMicro Andrew Feldman, Atom

CPUs can handle a lot of users at one time, which makes the SM10000 work extremely well for Web site business models that rely on giving away mostly free content with very few paid users. Popular Web services such as Google and Facebook rely on large numbers of users and work under this type of business model, Feldman says.

"The Internet [often is] about a free usage, advertised model," Feldman says. "What that means is you have a huge number of users with a very small number who will deliver money. Any given user cannot consume very much of the

Intel Atom + DRAM + ASIC = SeaMicro Simplification

SeaMicro has greatly simplified the heart of the server with its SM10000 server by creating credit card-sized "motherboards" that contain only the most basic

motherboards. Each motherboard is stripped down, containing only the Atom chip with a Poulsbo chipset, the SeaMicro ASIC chip, and 1GB or 2GB of DDR2

The ASIC chip attaches to the PCI-E bus of the I/O hub. The ASIC connects to the Atom chip by PCI-E, and it links to the other Atom servers and shared network and storage components through a high-bandwidth proprietary interconnect fabric that SeaMicro has developed.

Each credit card-sized motherboard fits with another seven motherboards onto a larger slab of PCB that SeaMicro calls a compute card.

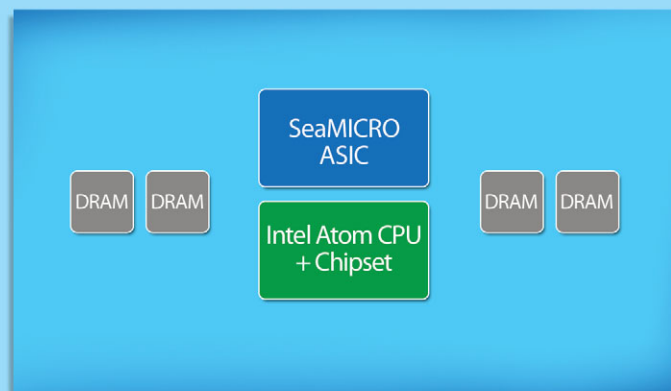
"We've chosen the most efficient CPU for this workload, which is the Atom,"

SeaMicro president and co-

founder Andrew Feldman says. "We removed 90% of the components on the motherboard and reduced the size of the motherboard from the size of a pizza box to the size of a credit card."



Source: SeaMicro



components required to operate the server: an Atom CPU (plus chipset), the proprietary SeaMicro ASIC, and DRAM memory.

The SM10000 uses a 1.6GHz single-core Intel Atom Z530 on each of its

memory. The motherboards contain no I/O hubs, instead using the PCI-E x2 interface in the Poulsbo chipset. The SeaMicro ASIC uses a virtualized I/O to handle all of the I/O functions.

CPU. . . . The more users you can put on a CPU, the more profitable you can be.

“Big, multicore processors suffer in that environment,” Feldman says. “It cuts them off at the knees.”

SeaMicro’s design of its credit card-sized Atom CPU motherboards resulted in reducing the number of components on the motherboard by 90%. SeaMicro has been able to reduce power usage by 75% using Atom and its new motherboard design vs. the multicore CPU and motherboard in traditional servers.

Such power reduction is important because, according to a 2006 EPA study, volume servers use more than 1% of all of the electrical power consumed in the United States.

“This is a big, big issue,” Feldman says. “Ten to 15 years ago, no one was talking about power. How did we get here? The Internet changed the character of work. [Computing] problems previously were large and complex.

Inside the company, you scheduled them to run [on the computing network] at night.

“With the Internet, work is generated outside the company, and it’s generated by a huge number of users,” he says. “The problems are different now. They’re huge in number. In the past, they were complex and interrelated. Now they’re simple, all independent tasks, like checking email, [tweeting], using Facebook.”

The Battle Against Idleness

Feldman says another problem Web servers have with power consumption is that they are built to handle maximum, rather than average, load. A Web site needs to have enough hardware available to remain accessible at peak usage times, but that means that much of the server’s processing power sits idle during average usage times. Of course, the

server’s CPUs and other components continue to draw electrical power even during these low traffic times.

Most servers today contain multicore processors, which Feldman says aren’t efficient enough in terms of idle power consumption or in terms of delivering the kind of performance Web-based applications use. Research at Intel and AMD into multicore processors “has taken them far afield from what Yahoo!, Facebook, Google, etc. [need for] their applications,” Feldman says. “Tricks and technologies are used to divide up performance. These draw power and add an overhead that’s very damaging on simple workloads. . . . Today’s large server parts are not well-suited for the [most common] Web workload.”

Idle times aren’t as costly for the SM10000 because the Atom processors and small motherboards use much less power than the traditional server chips and motherboards, Feldman says. In

Traditional Server Vs. SM10000

A traditional server consists of 40 rack units, and most of today’s servers use quad-core processors. The SM10000 consists of 10 rack units, requiring one-fourth of the physical space and one-fourth of the power draw of a traditional server.

In the early days of the Internet, Web sites purchased servers containing the most advanced and powerful processors, then designed huge, centralized databases that could work with the processors, SeaMicro president and co-founder Andrew Feldman says. However, such systems typically require a lot of power.

Today, the largest Web sites divide the data into small chunks and then spread the small chunks over hundreds and thousands of chips, Feldman says. The large amount of data these Web sites generate then becomes more manageable.

“Today, the work it comes in bursts,” Feldman says. “It’s often low. The average utilization for Google is 17% to 20%. Servers failed to adapt to the small, simple workload. They’re punishingly poor performers in idle mode.”



Specifications

Processing Power

- 512 1.6GHz single-core Intel Atom Z530 CPUs per 10RU system
- Eight CPUs per compute card (measuring 5 by 11 inches)
- 64 compute cards per system
- Users can deploy 2,048 CPUs in a standard 8kW server rack

Memory & Networking

- 1GB or 2GB of DDR2 memory per Atom CPU, up to 1TB per system
- 1.28Tbps networking, supercomputing-style fabric (all intra-communication occurs over this fabric, and each Atom CPU has access to about 2.5Gbps of bandwidth)
- Eight (minimum) to 64 (maximum) 1Gb Ethernet interfaces or two (minimum) to 16 (maximum) 10Gb Ethernet interfaces
- Up to eight hot-swappable Ethernet cards per system

Storage

- 2.5-inch form factor storage drives (HDD or SSD)
- SATA HDDs, 320GB or 500GB storage capacity
- SATA SSDs, 80GB or 256GB storage capacity
- Zero (minimum) to 64 (maximum) physical drives
- Up to eight hot-swappable storage cards, each supporting eight drives, per system

Physical Characteristics

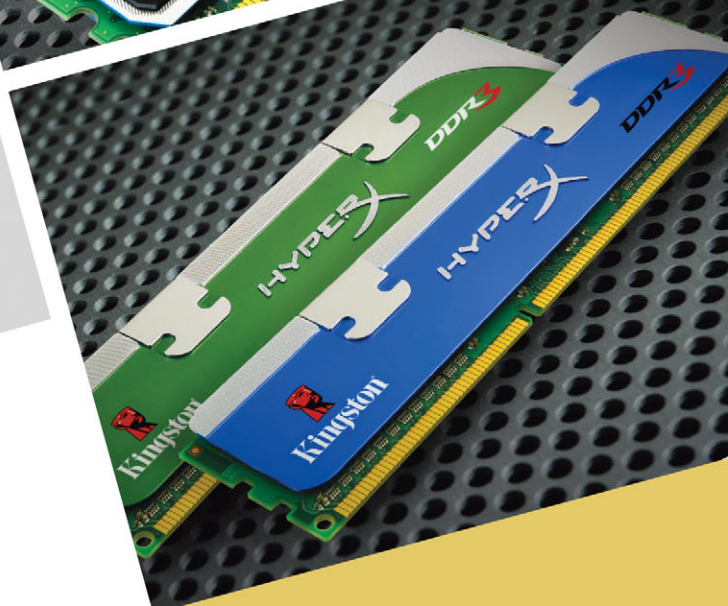
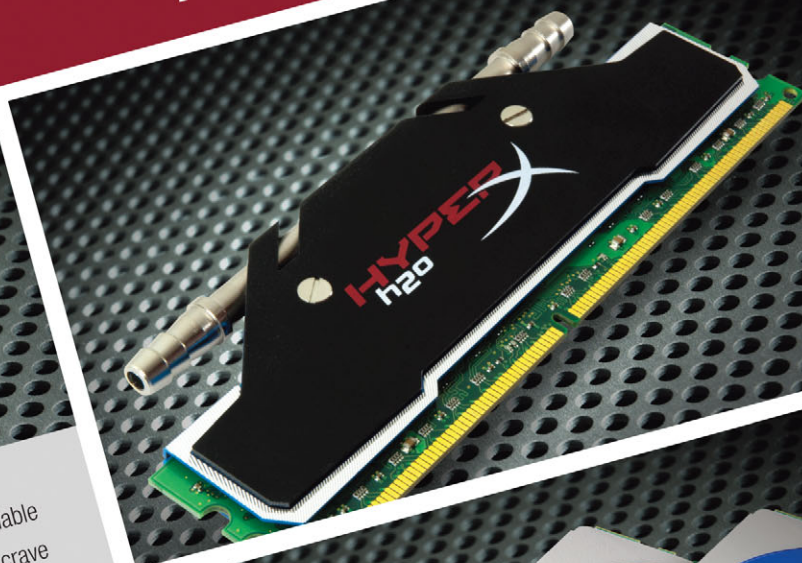
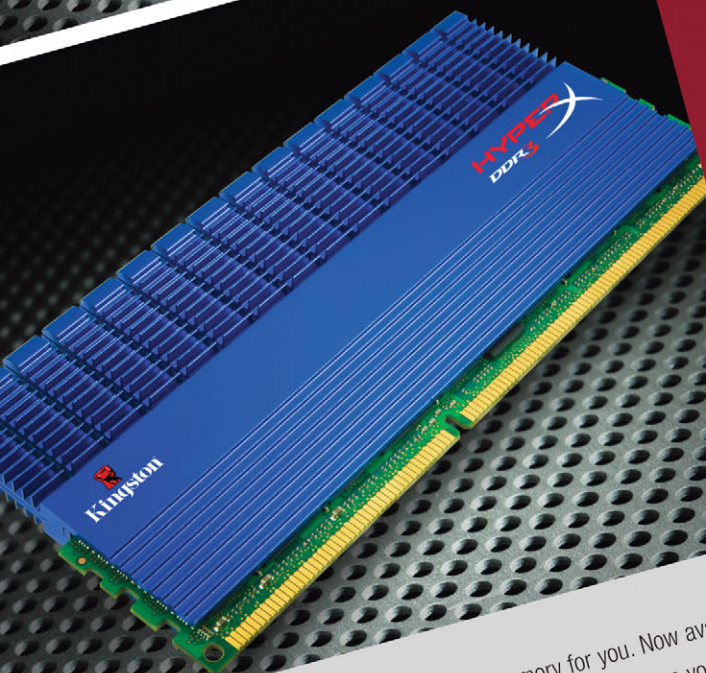
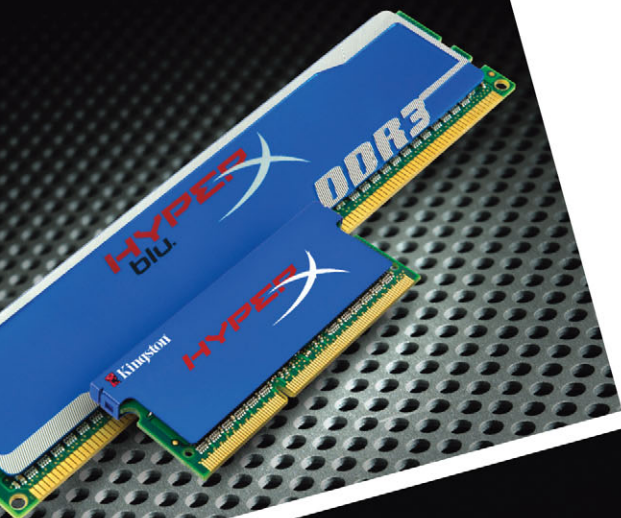
- Dimensions: 17.5 x 19 inches x 30 inches (HxWxD)
- Cooling: Dual redundant fan tray; front to rear air flow
- Operating temperature: 50 to 95 degrees Fahrenheit
- Power supply: AC, 100 to 240V single phase

Price: \$139,000

Source: SeaMicro



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fact, SeaMicro estimates that the savings of using the SM10000 vs. a traditional server increases the longer the system is in an idle state. According to SeaMicro, the financial benefit of using the SM10000 instead of a traditional server is four times greater at 10% utilization than at 50% utilization.

“You’re stuck with the fact that four cores are trying to get off the chip, causing memory bandwidth problems [and increasing power draw],” Feldman says.

SeaMicro’s History

SeaMicro’s goals have been consistent throughout its history. SeaMicro started in July 2007 with the idea of developing servers that require less power and physical space while being more efficient at running Web-based applications. The company raised \$25 million from venture capital firms and received a \$9.3 million grant from the U.S. Department of Energy for developing technologies

aimed at using energy more efficiently in data centers.

“[The DOE] had a program, looking to support technology that reduces data center power drain,” Feldman says. “Not being very sophisticated with the government, we just sat down and wrote [the grant request]. . . . We didn’t have any lobbyists in Washington, but we ended up with more [grant money] than IBM, HP, Dell, Cisco, etc.”

SeaMicro’s CTO and co-founder, Gary Lauterbach, was a chief micro-processor architect at Sun Microsystems and AMD before co-founding SeaMicro.

“What he saw is that product management made requests to increase performance by 7% or 8%,” Feldman says. “They were OK if the power usage went up 12%—that’s a bad buy.”

Technical Breakthroughs

There are four innovations that make the SM10000 possible.

CPU I/O virtualization. This technology let SeaMicro remove 90% of the components from the motherboard, greatly reducing the overall system power requirements. With CPU I/O virtualization, components such as BIOS, storage, and external network access can be shared across hundreds of CPUs. The CPU I/O virtualization makes it possible for power-efficient CPUs, such as the Atom, to replace the power-hungry multicore processors used in today’s servers.

Interconnect fabric. SeaMicro’s “super-computer-style interconnect fabric” allows movement of traffic between all of the credit card-sized motherboards at a speed of 1.28Tbps.

Load balancing. SeaMicro’s system can allocate workloads to specific Atom CPUs, based on power needs, using DCAT (Dynamic Compute Allocation

The SM10000’s Power Requirements

As SeaMicro began designing its SM10000 with the idea of cutting the power requirements by 75% vs. traditional servers, its engineers quickly realized that switching to Atom CPUs alone would not be enough to reach their goals.

“We set off to solve the most pressing problems in the data center: power and space,” SeaMicro president and co-founder Andrew Feldman says.

Figure D shows the estimated power usage by various components in today’s traditional servers. As you can see, on most motherboards used in servers, the CPU alone uses about one-third of the overall power, while other components in the system, which SeaMicro’s Feldman calls “everything else,” use about two-thirds of the power (Figure A). Simply cutting the CPU requirements to one-fourth and leaving the remainder of the motherboard in place (figure B) didn’t result in the desired power requirements. To cut the overall power requirement of the SM10000 server to one-fourth, SeaMicro

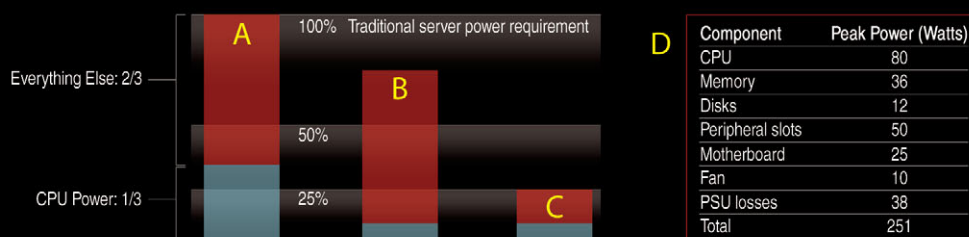
engineers had to cut the power requirements for “everything else,” too, resulting in the desired power requirement (figure C).

“Even with a CPU that had half the performance but drew no power in the same architecture, you’d have a system that had one-half the performance but only save one-third of overall power consumption,” Feldman says. “That’s going backward. We had to think about how to redo the architecture.”

The only components remaining on the credit card-sized motherboards are the Atom CPU and its chipset, DRAM, and the customized SeaMicro ASIC.

“When we set out to reduce power and space by 75%, even if the CPU drew no power, it wouldn’t be enough,” Feldman says. “We needed to develop a new architecture that dramatically reduced power for everything else. We had to make meaningful architectural improvements to the non-CPU portion.”

Sources: SeaMicro, EPA



Technology). The system creates virtual IP addresses to which groups of between one and 512 Atom servers can be assigned, allowing for efficient distribution of workloads.

CPU-independent. Although SeaMicro's system is not specific to one type of CPU, Feldman says the company's initial round of SM10000 servers will use only Atom CPUs. However, ARM Cortex-A9 chips or other types of processors will work with the SeaMicro system.

"It supports all CPUs, and it's the first architecture to do that," Feldman says. "Because we're CPU-independent, we can specialize. We could make one box with Xeons, and one with ARMs."

Feldman says developing the technologies and designing the SM10000 was a difficult, challenging process.

"Designing ASICs [application-specific integrated circuits] is hard," Feldman says. "Writing software that manages a complex system is hard. Coming up with a PCB design is a hard problem."

The Right Server For The Right Job

Encouraging server customers to switch from more expensive multicore CPUs to inexpensive Atom CPUs put SeaMicro in a bit of an awkward situation with CPU manufacturers like Intel, which provides both types of

processors. Feldman says Intel was leery of the idea of the SM10000 during its initial discussions with SeaMicro.

"At first [the concept] was received extremely poorly," Feldman says, "but we were not replacing one big CPU with one Atom. We were replacing one with 12 Atoms. The hairs on the back of their necks smoothed down after that. . . . By us selling lots of little CPUs, we increased the revenue opportunities for Intel."

The SM10000 runs Linux, although it potentially can run as a VM with Windows Server. However, at the time the SM10000s were initially announced in June, there was no official Windows support. SeaMicro began selling the SM10000 servers at the end of July for \$139,000.

Feldman readily acknowledges that the SM10000 won't work in every server situation for every company. For example, companies that need their servers to perform complex computations or that don't have large amounts of idle time for their servers won't receive the power and cost savings benefits from the SM10000.

"This is not a solution for everything," Feldman says. "The database tier, for example, might not be a good place for us."

Still, the opportunity to reduce server power and space requirements by up to 75% has a lot of Web companies

curious and interested in the SM10000, Feldman says.

"Right now, we have more orders than we can ship," he says. "That's an exciting place to be."

Feldman says many companies are initially ordering the SM10000 servers to see how they compare to their current servers.

"That's a prudent thing to do," Feldman says. "It's not a \$4,000 box. Many of the orders are for initial evaluations and pilot programs."

At this point, SeaMicro is the first company to announce a low-power server based on this technology. We'll see whether SeaMicro's idea results in other companies developing servers based on Atom and other chips that have similar power and cost savings.

The EPA estimates that servers and data centers in the United States will use about 120 billion kilowatt hours of electrical power in 2010. The benefits of using less power in data centers not only will save companies money but also could alleviate strain on the U.S. power grid, Feldman says, and further advance green technology ideas in the high-tech market.

"I think we have a chance to make a meaningful impact in a short time horizon," Feldman says. "Biofuels, etc.—that's not going to happen next quarter." ▲

by Kyle Schurman

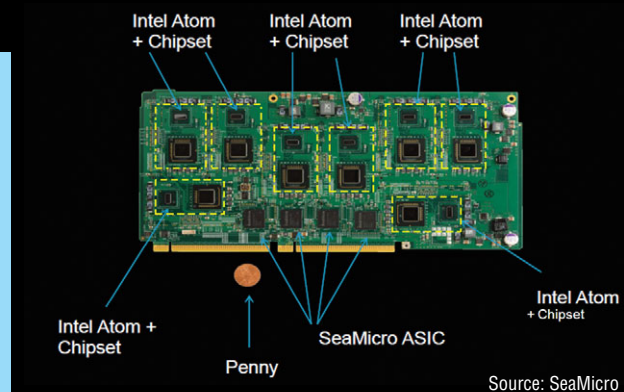
SeaMicro Computer Card

The SeaMicro SM10000 server consists of 64 compute cards per 10RU system.

The compute card, pictured here, measures about 5 x 11 inches (HxW). SeaMicro calls each Atom and motherboard combination a single server. Eight of the single servers end up on one compute card.

"Sixty-four boards like this slide into an RU," SeaMicro president and co-founder Andrew Feldman says. "It's 512 Atom machines drawing less than 2 kilowatts. You can get four of these into a standard rack; that's 2,048 CPUs."

Each compute card also contains four of the SeaMicro custom ASICs. Each Atom has access to 1GB or 2GB of memory, meaning the overall server can contain more than 1TB of total memory.



spotlight

There's Always Room For More RAM

CPU'S MEMORY BUYER'S GUIDE

Your average PC user looks for a computer with as much RAM as he can afford. With power users, the type, speed, latency, and cooling of the memory is often just as important as the capacity. The right memory kit can be the difference between whether or not your computer is responsive enough when you're video editing, gaming, designing, or any other memory-intensive task. Our memory buyer's guide includes more than 30 options to help find the module or kit that's right for you. In our first two pages, we'll summarize the key evolutions in memory over the past year to simplify your research process.

In September of 2009, Intel released its P55 chipset, which featured a dual-channel memory controller as opposed to the X58's triple-channel interface. Intel's new dual-channel design is more cost-efficient than its triple-channel counterpart, because you'll only have to invest in a kit with two sticks of memory to get started. Similar to the memory modules on X58 systems, Intel recommends that the dual-channel memory run at no more than 1.65V.

Jeremy Mortenson, senior product manager for Crucial, says "XMP has become the dominant performance profile for DRAM. With the strength of the Core i5 and i7 processors in the market and support in the most recent chipsets, many motherboard manufacturers are implementing this specification in their BIOS."

Not too much has changed, memory wise, on the AMD side. AM3 processors are the only AMD CPUs that support DDR3; all other current AMD systems are dual-channel. To ease your ability to overclock memory, AMD added BEMP (Black Edition Memory Profiles) to its AMD OverDrive 3.0 software. Once the memory is detected, AMD OverDrive can connect to the Internet and download a BEMP file that matches your modules, which is a bit more handy for vendors than embedding the profile into the module.

"From a technology standpoint, we've seen higher adoption of DDR3 across the segments due to additional chipsets from Intel and AMD. We've also seen some higher densities and faster speeds across all desktop, notebook, and server products," says Mortenson.

You can find DDR3 dual-channel kits ranging from 1,066MHz to 2,533MHz. The 2,533MHz maximum speed is up from around 2,300MHz last September. Another change has been the increased availability of kits using 4GB modules, such as 8GB dual-channel and 12GB triple-channel bundles, which cater to power users who demand high densities of memory. Single 4GB SO-DIMMs are available for notebook owners who want to pump up their RAM.

HTPC owners may want to check out the new low-voltage DDR3 kits. Unlike energy-efficient processors, low-power memory is capable of running at speeds and latencies comparable to high-end sticks. For example, Kingston's LoVo is available at speeds up to 1,800MHz at 1.35V or 1,333MHz at 1.25V. The reduced heat and slightly less power will be beneficial to improve overall system performance within cramped cases where hot memory may reduce the efficiency of other components.

The increase of heat within the computer, such as from today's powerful CPUs and graphics cards, has created an increased need for memory cooling. Rather than just a crimp-on heat spreader, most modules beyond 1,800MHz will feature tall fins that create more surface area to increase the heat dissipation rate. A number of clip-on memory module fans are also available to help you pull the hot air from the modules. Mortenson tells us that "With higher-density modules and fully populated boards running at higher overclocked speeds, cooling will continue to be a consideration with memory."

Those shopping for RAM may be pleasantly surprised by the prices. A recent study from Gartner found that DRAM prices were down for the first time in a year, and Gartner expects prices to slide for the rest of the year. RAM had become so expensive that, according to Gartner, it accounted for 15% of the material cost of the average midrange PC. The lower prices are due to the increased production by DRAM manufacturers, which created a greater supply of chips. So don't be too surprised if you find the prices listed here to be higher than when you're shopping for RAM. Happy hunting. ▲

by Nathan Lake

SPOTLIGHT: Desktop Memory DDR3



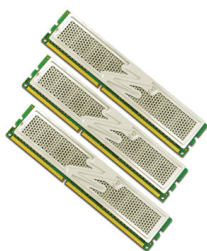
Corsair CMT6GX3M3A1600C7

\$299.99 | www.corsair.com

Why we dig it: This 1,600MHz 6GB kit of CAS 7 memory looks great inside your case, and it runs at 1.65V. The Dominator modules feature Corsair's DHX+ technology, and the included Airflow II fan assembly will keep your memory running cool for long gaming sessions.

Who should apply: Those who are looking for a combination of high-speed, low-latency, and attractive sticks for their power user build.

Capacity: 6GB (three 2GB modules) | Speed: PC3-12800 | Timings: 7-7-7-20



OCZ OCZ3P2133LV6GK

\$225.99 | www.ocztechnology.com

Why we dig it: The Platinum series works at 2,133MHz with additional overclocking potential for enthusiasts and gamers. Qualified to run at a low 1.65V on the X58 platform, the modules offer stability that won't inhibit the functionality of Core i7 CPUs.

Who should apply: This kit is developed for speed-hungry enthusiasts making use of the incredible frequencies supported by the X58 platform.

Capacity: 6GB (three 2GB modules) | Speed: PC3-17000 | Timings: 8-9-8-27



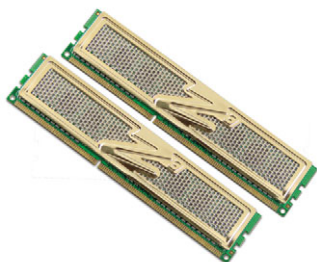
G. Skill F3-1600CL7D-4GBFLS

\$189.99 | www.gskill.com

Why we dig it: This Flare series memory kit from G. Skill is hand-tested on AMD platforms to ensure compatibility with AMD's Phenom II X6 processors. The DDR3-2000, CL7 speeds also mean that you'll have plenty of performance from the 4GB kit.

Who should apply: Performance enthusiasts who are also concerned how the memory will run on a system with a six-core AMD processor.

Capacity: 4GB (two 2GB modules) | Speed: PC3-16000 | Timings: 7-9-7-24



OCZ OCZ3G1333LV8GK

\$185 | www.ocztechnology.com

Why we dig it: OCZ's 8GB dual-channel kit supports the latest memory-hungry applications and games to help you experience performance gains and maximum multitasking productivity. The modules also operate at low-voltage specs for use on all the latest platforms.

Who should apply: It's ideal for workstations with 64-bit operating systems where users can take advantage of high-density memory configurations when working with intensive design and multimedia applications.

Capacity: 8GB (two 4GB modules) | Speed: PC3-10666 | Timings: 9-9-9-20



OCZ OCZ3FXE2400LV4GK

\$169.99 | www.ocztechnology.com

Why we dig it: The Flex EX 4GB kit can deliver a high frequency of 2,400MHz while keeping the sensitive memory chips cool with its unique hybrid passive and watercooling heatsink.

Who should apply: Enthusiasts who want the fastest memory available with additional overclocking headroom and specialized memory cooling capabilities.

Capacity: 4GB (two 2GB modules) | Speed: PC3-19200 | Timings: 9-11-9-28



Mushkin 996902

\$159.99 | www.mushkin.com

Why we dig it: The Ridgeback heat spreaders feature a footprint that's been engineered to meet or exceed the thermal performance of larger, taller thermal designs. The 2,000MHz dual-channel kit's timings offer improved performance over similar speed modules when properly tuned.

Who should apply: Performance enthusiasts with computers that feature large, wide CPU coolers where the size of the cooler may interfere with or prevent the use of memory with tall heat spreaders.

Capacity: 4GB (two 2GB modules) | Speed: PC3-16000 | Timings: 7-10-8-27

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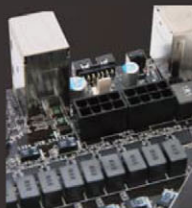
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Video	6x PCI-Express x16 slots Support NVIDIA SLI & ATI CrossFireX
Audio	Quantum Wave Audio Card THX TruStudio PRO Support EAX ADVANCED HD
LAN	Dual 10/100/1000 Mbits/s LAN
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SPOTLIGHT: Desktop Memory DDR3



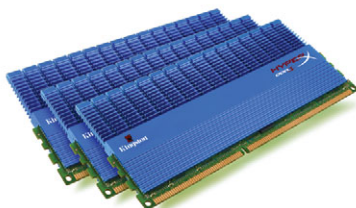
PNY MD4096KD3-1600-X8

\$159.99 | www.pny.com

Why we dig it: The 4GB kit operates at 1,600MHz, and it features sleek aesthetics with black XLR8-branded heat spreaders. PNY backs the modules with a lifetime warranty.

Who should apply: Hardware enthusiasts and gamers alike will enjoy a dual-channel DDR3-1600 kit for fast performance and overclocking potential.

Capacity: 4GB (two 2GB modules) | Speed: PC3-12800 | CAS: 8-8-8-24



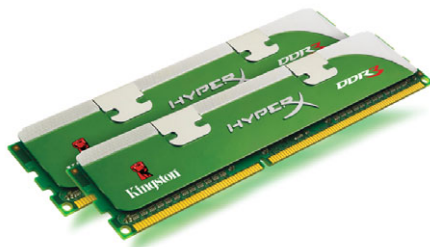
Kingston KHX2333C9D3T1K3/3GX

\$158 | www.kingston.com

Why we dig it: At 2,333MHz, it's the highest triple-channel Intel Certified Frequency kit, and it's also optimized for Intel's XMP. For cooling, the modules feature Kingston's T1 heat spreaders to further remove heat buildup.

Who should apply: Extreme PC enthusiasts who are looking for maximum performance from their X58-based system.

Capacity: 3GB (three 1GB modules) | Speed: PC3-15000 | Timings: 9-11-9-27



Kingston KHX1600C9D3LK2/4GX

\$125.99 | www.kingston.com

Why we dig it: The low-voltage RAM runs at 1,600MHz at 1.35V, and it features Kingston's lifetime warranty and 24/7 tech support.

Because the lower voltage will reduce internal system heat, the modules in turn can reduce the need for airflow (and thus increased noise) within the system.

Who should apply: The low-voltage memory is ideal for users who can benefit from lower power consumption and reduced heat, such as HTPC builders.

Capacity: 4GB (two 2GB modules) | Speed: PC3-12800 | Timings: 9-9-9-27



Crucial BL2KIT25664FN1608

\$119.99 | www.crucial.com

Why we dig it: This 4GB DDR3-1600 kit features on-board temperature sensors that integrate with the EEPROM to provide up-to-the-second temperature readings to the Crucial Ballistix temperature monitoring utility. You can see how activity, voltage, speed, and airflow all impact the temperature of the memory in real time.

Who should apply: Performance enthusiasts who want the ability to monitor memory temperatures when overclocking their systems to ensure that the modules don't run too hot.

Capacity: 4GB (two 2GB modules) | Speed: PC3-12800 | Timings: 8-8-8-24



A-Data AX3U1600GB2G9-DG2

\$99.99 | www.adatausa.com

Why we dig it: The XPG Gaming Series v2.0 modules feature double the amount of copper on the PCB to increase power efficiency and remove heat. The DDR3-1600 kit runs at a working temperature of 1.65V with the XMP profile's 9-9-9-24 timings.

Who should apply: Gamers who want RAM that's able to effectively dissipate heat to help ensure reliable performance.

Capacity: 4GB (two 2GB modules) | Speed: PC3-12800 | Timings: 9-9-9-24



Patriot Memory PGS34G1600ELKA

\$92.99 | www.patriotmemory.com

Why we dig it: When installed on a system with an AM3 processor and AMD 7 or 8 Series chipset, you can use AMD OverDrive to fine-tune the memory bandwidth, timing, and voltages.

Who should apply: Gamers and performance enthusiasts who want the ability to easily adjust memory performance through AMD's OverDrive.

Capacity: 4GB (two 2GB modules) | Speed: PC3-12800 | Timings: 9-9-9-24

SPOTLIGHT: Desktop Memory DDR2



Corsair TWIN2X4096-8500C5D

\$139.99 | www.corsair.com

Why we dig it: This 4GB kit is perfect for adding memory to an existing system, because the SPD is backward-compatible. The Dominator DDR2-1066 4GB kit features a CAS latency of 5, and it runs at 2.1V.

Who should apply: People who are running 2GB in a DDR2 system and want to upgrade their computer to a 64-bit OS and take advantage of the increased memory capacity capabilities.

Capacity: 4GB (two 2GB modules) | Speed: PC2-8500 | Timings: 5-5-5-15



Crucial BL2KIT25664AA80A

\$112.99 | www.crucial.com

Why we dig it: The Ballistix 4GB kit features a latency of CL4 to offer a performance boost for systems running DDR2-800 memory. The modules also operate at 2.0V, so there's some headroom for overclocking to 1,066MHz.

Who should apply: Power users who are looking for fast DDR2-800 memory that's overclockable.

Capacity: 4GB (two 2GB modules) | Speed: PC2-6400 | Timings: 4-4-4-12



OCZ OCZ2RPR800C44GK

\$113.99 | www.ocztechnology.com

Why we dig it: These Reaper modules offer CAS 4 latencies to provide maximum memory bandwidth and enhance gaming and productivity on Vista and Windows 7 systems. The passive cooling heatpipe also helps to remove heat from the modules.

Who should apply: Computer enthusiasts and professionals utilizing high-bandwidth video, music, and graphics applications will benefit from the balance of latency, speed, and density.

Capacity: 4GB (two 2GB modules) | Speed: PC2-6400 | Timings: 4-4-4-15



OCZ OCZ2RPR10664GK

\$100 | www.ocztechnology.com

Why we dig it: The Reaper HPC Series features an innovative passive cooling heatpipe conduit to more effectively dissipate heat produced by the memory when overclocking. These Reaper modules also offer EPP (Enhanced Performance Profiles) programmed into the SPD and will instantly boot at the rated specs on Nvidia chipsets without manual setup.

Who should apply: Gamers playing the latest DirectX 10 and 11 titles that can use more than 2GB of RAM.

Capacity: 4GB (two 2GB modules) | Speed: PC2-8500 | Timings: 5-5-5-18



Patriot Memory PV224G8500ELKB

\$96.99 | www.patriotmemory.com

Why we dig it: Viper II Series modules from Patriot Memory are built with presorted integrated circuits to optimize quality and performance. Patriot uses aircraft-grade aluminum heat spreaders to increase reliability when overclocking. The DDR2 kit is designed to operate at 1,066MHz with 5-5-5-15 timings. It also includes a free activation key for 3DMark Vantage.

Who should apply: Performance enthusiasts who want to push the performance levels on DDR2 systems that can handle 1,066MHz and above.

Capacity: 4GB (two 2GB modules) | Speed: PC2-8500 | Timings: 5-5-5-15



A-Data AX2U800GB2G5-2G

\$84.99 | www.adatausa.com

Why we dig it: A-Data's Gaming Series sticks include aluminum heat spreaders that cover eight layers of PCB. The 4GB dual-channel kit runs at 2.1V with 5-5-5-12 timings.

Who should apply: Budget buyers who want a 4GB DDR2 kit that features low-latency timings.

Capacity: 4GB (two 2GB modules) | Speed: PC2-6400 | Timings: 5-5-5-12

SPOTLIGHT: Notebook Memory DDR3



G. Skill F3-8500CL7D-8GBSQ

\$229.99 | www.gskill.com

Why we dig it: Many new notebooks can support up to 8GB of memory, but vendors typically only install 2GB or 4GB. With this 8GB kit, you can improve your laptop's ability to run video- and photo-editing software, as well as games.

Who should apply: People running a notebook as a desktop replacement who want to improve system performance for demanding applications.

Capacity: 8GB (two 4GB modules) | Speed: PC3-8500 | Timings: 7-7-7-20



Transcend TS512MSK64V1N

\$190 | www.transcendusa.com

Why we dig it: The 4GB TS512MSK64V1N features a default latency of 7, and it can be programmed with a CAS latency of 6, 7, or 8. The addition of a single 4GB module will be a big boost to notebooks running a 64-bit OS.

Who should apply: Those with new notebooks who need a significant jump in memory capacity via a 4GB SO-DIMM. It's also helpful for performance enthusiasts who need a 4GB notebook module with a low latency.

Capacity: 4GB (one 4GB module) | Speed: PC3-8500 | Timings: 7-7-7-15



Patriot Memory PSD32G13332S

\$169.99 | www.patriotmemory.com

Why we dig it: Part of Patriot Memory's Signature Line, the PSD32G13332S is a 4GB SO-DIMM that runs at 1,333MHz with CAS 9 latency timings.

Who should apply: Power users with a notebook that can use DDR3-1333 RAM and want to pump up the system with an extra 4GB of RAM.

Capacity: 4GB (one 4GB module) | Speed: PC3-10600 | Timings: 9-9-9-24



Corsair CMSO4GX3M1A1333C9

www.corsair.com

Why we dig it: This 4GB DDR3 module is the perfect way to enhance the performance of a notebook that runs a 64-bit OS. The DDR3-1066 memory features a CAS latency of 9.

Who should apply: People with a notebook that supports more than 4GB of memory, so they can pair the module with an existing DDR3 module.

Capacity: 4GB (one 4GB module) | Speed: PC3-8500 | Timings: 9-9-9-24



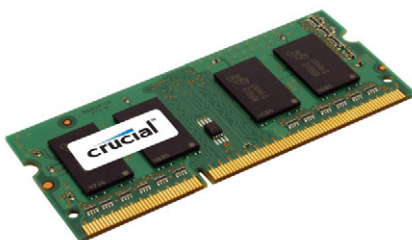
Kingston KHX1600C9S3K2/4GX

\$147 | www.kingston.com

Why we dig it: The 4GB kit runs at 1,600MHz to accelerate the memory performance on today's high-end notebooks. The modules operate at 1.5V and feature timings of 9-9-9-27.

Who should apply: Performance enthusiasts who want to pump up their notebook's ability to play games and run demanding applications.

Capacity: 4GB (two 2GB modules) | Speed: PC3-8500 | Timings: 9-9-9-27



Crucial CT2KIT25664BC1339

\$109.99 | www.crucial.com

Why we dig it: The kit runs at 1,333MHz at 1.5V, and it's backed by Crucial's lifetime limited warranty. Crucial also tells us that these modules can be used on Apple products.

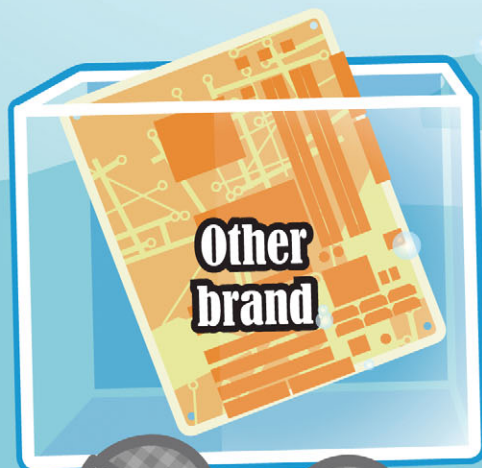
Who should apply: Laptop users (either PC or Mac) who want to jump to 4GB of RAM.

Capacity: 4GB (two 2GB modules) | Speed: PC3-10600 | Timings: 9-9-9-24

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SPOTLIGHT: Notebook Memory DDR2



Patriot Memory PSD24G8002S

\$169.99 | www.patriotmemory.com

Why we dig it: The affordable 4GB module gives you a way to upgrade a notebook beyond 4GB without needing to remove all of the system's existing RAM. The SO-DIMM runs at 800MHz and 1.8V.

Who should apply: People who want to upgrade the memory on their laptop past 4GB and only have one free slot.

Capacity: 4GB (one 4GB module) | Speed: PC2-6400
Timings: 6-6-6-18



Corsair VS4GSDS800D2

\$149.99 | www.corsair.com

Why we dig it: Ideal for those stepping up to a 64-bit OS on a budget, the 4GB DDR2-800 module features a CAS latency of 6, and it runs at 1.8V.

Who should apply: People with a notebook that supports more than 4GB of memory, so they can pair the module with an existing DDR2-800 module.

Capacity: 4GB (one 4GB module) | Speed: PC2-6400 | Timings: 6-6-6-18



Kingston KHX6400S2ULK2/4G

\$127 | www.kingston.com

Why we dig it: The high-performance, low-latency HyperX SO-DIMM notebook memory provides support for mobile gaming. These modules are also backed by a lifetime warranty and free 24/7 tech support.

Who should apply: Netbook users and notebook gamers looking for a performance boost.

Capacity: 4GB (two 2GB modules) | Speed: PC2-6400 | Timings: 4-4-4-12



Crucial CT2KIT25664AC800

\$95.99 | www.crucial.com

Why we dig it: Crucial's 4GB DDR2-800 kit offers a CAS latency of 6 and runs at 1.8V, and because it's available as a kit, you can be sure that the matched pair will function well together.

with a 64-bit version of Windows may also consider the 4GB upgrade, because the 64-bit OS can use the entire 4GB.

Who should apply: Those who want to upgrade the multitasking capabilities of their notebook. People

Capacity: 4GB (two 2GB modules) | Speed: PC2-6400 | Timings: 6-6-6-18



G. Skill F2-6400CL5D-4GBSQ

\$84.99 | www.gskill.com

Why we dig it: All but 10 of the 158 reviews on Newegg give this 4GB kit a five-star or four-star rating. The 4GB kit features a CAS latency of 5 and runs at 1.8V.

Who should apply: Those looking to upgrade a laptop that requires DDR2-800 SO-DIMMs.

Capacity: 4GB (two 2GB modules) | Speed: PC2-6400 | Timings: 5-5-5-15



A-Data AD2S800B2G5-R 2GB

\$44.99 | www.adatausa.com

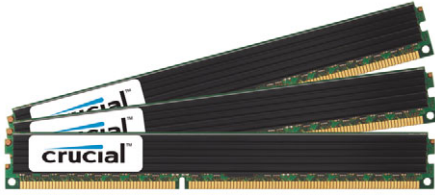
Why we dig it: A-Data's Premier Series are stringently tested to meet JEDEC standards. The 2GB module runs at a CAS latency of 5 and 1.8V. It's covered by A-Data's lifetime warranty.

so that it runs well with the existing memory on your system.

Capacity: 2GB (one module) | Speed: PC2-6400 | Timings: 5-5-5-15

Who should apply: Notebook users who want a DDR2-800 SO-DIMM that meets memory standards,

SPOTLIGHT: Server Memory



Crucial CT3KIT51272BB1339

\$569.99 | www.crucial.com

Why we dig it: The 12GB bundle is dual ranked, registered, and features error-correcting code. And even with the ECC/speed tradeoff, the modules operate at 1,333MHz. There's a black heat spreader to help lighten the temperatures of the RAM.

Who should apply: IT staff who want to increase the speed and capacity of their server memory.

Capacity: 12GB (three 4GB modules) | Speed: PC3-10600 | Timings: 9-9-9



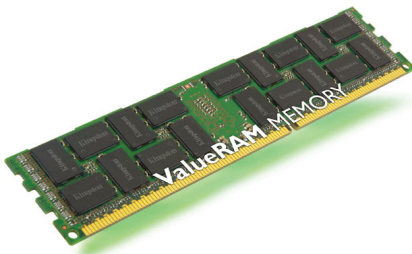
Patriot Memory PS34G13ER-E

\$154.99 | www.patriotmemory.com

Why we dig it: Patriot Memory's server options include free customer service and a lifetime warranty. The 4GB module's 1,333MHz and CL9 speed are impressive, too. It's ECC registered and runs at 1.5V.

Who should apply: Data center managers who are looking for fast, high-capacity modules that also help to reduce the total cost of ownership for the server.

Capacity: 4GB (one 4GB module) | Speed: PC3-10600 | Timings: 9-9-9



Kingston KVR1333D3D4R9S/4GED

\$148 | www.kingston.com

Why we dig it: This 4GB ECC registered module features a fully controlled BOM (bill of materials), assuring you will receive the same module each time you order it. The DDR3-1333 memory is dual ranked and features a CAS latency of 9 while running at 1.5V. As with all Kingston server memory, 100% of modules undergo 24-hour burn-in stress testing before shipment.

consistency of fully controlled builds along with PCN (product change notification) support. The full BOM control comes at no additional cost to the customer and will result in dramatic reductions in potential compatibility issues after initial system qualification.

Capacity: 4GB (one 4GB module) | Speed: PC3-10600 | Timings: 9-9-9

Who should apply: Companies building or using DDR3-based white-box servers that value the

SPOTLIGHT: Mac Memory



Corsair CMSO8GX3M2A1333C9

\$299.99 | www.corsair.com

Why we dig it: 8GB is ideal for anyone working with images, video, and content-creation tools, and this DDR3-1333 memory features a CAS latency of 9.

Who should apply: People with a unibody MacBook or MacBook Pro. Just replace your current modules to experience the 8GB memory capacity.

Capacity: 8GB (two 4GB modules) | Speed: PC3-10600 | Timings: 9-9-9-24



G. Skill FA-8500CL7D-8GBSQ

\$249.99 | www.gskill.com

Why we dig it: G.Skill's Apple series memory modules pass strict internal tests with MacBooks to ensure the best stability and compatibility. This 8GB kit runs at a CAS latency of 7.

Who should apply: Mac users who are interested in bumping up the memory capacity on their iMac, Mac mini, MacBook, or MacBook Pro.

Capacity: 8GB (two 4GB modules) | Speed: PC3-8500 | Timings: 7-7-7-20



A-Data SU3S1333B4G9-R

\$144.25 | www.adatausa.com

Why we dig it: A-Data guarantees that its Apple Series modules are compatible with MacBook, MacBook Pro, iMac, and Mac mini systems. The 1,333MHz modules are designed to help maximize memory for Mac products that support the PC3-10600 speed.

Who should apply: Mac owners who want to replace or increase the RAM on their Mac to 1,333MHz modules.

Capacity: 4GB (two 2GB modules) | Speed: PC3-10600 | Timings: 9-9-9-24



The Bleeding Edge Of Software

Inside The World Of Betas

Dia 0.97.1

Say you need to create good-looking network-map diagrams and block diagrams. Maybe you need to make a flowchart or lay out an electrical circuit graphically. Oh yeah, and you don't have a few hundred bucks for Microsoft Visio. There's always the drawing component of Open Office, but it's a bit too "general purpose" when what you really want is the ability to draw a fairly simple diagram. Thankfully, there's Dia for Windows, Linux, and Mac OS.

Dia is to Visio as The GIMP is to Photoshop: a generally equivalent free program that (arguably) lacks some of the polish and shine of its commercial competitor but is still able to do most of what the commercial product does once you learn its interface. Unlike The GIMP, however, Dia's interface is very straightforward.

Start by selecting a symbol set, such as flowchart shapes (squares, circles,

Dia 0.97.1

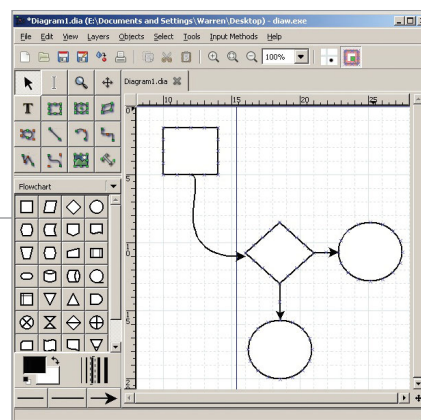
Publisher and URL: The Dia for Windows Project, dia-installer.de

ETA: Q1 2011

Why You Should Care: It's an approachable and capable (and free) diagramming app.

diamonds, etc.), network shapes (desktop PCs, laptops, servers, switches, etc.), circuit components (resistors, capacitors, fuses, etc.), and then placing the shapes on the workspace. Next, draw lines between the components as necessary, adding arrow-ends or dotted lines as you see fit. The smart part of all this is that Dia keeps track of all of these objects as vectors and automatically joins and links objects; you can drag objects around, and the lines connecting them automatically stretch. The art continues to look crisp as you shrink or expand diagrams, because they aren't bitmaps.

Dia can export several file types, including PNG, SVG, EPS, DXF, BMP, JPG, and many others, meaning that you can use its diagrams in pretty much anything.



There's no OLE embedding, however, so changing a diagram means you'll need to reimport it into your Word document, for example.

Development seems to have dramatically slowed on Dia, especially since its original developers have moved onto other projects. But Dia's "eternal beta" status shouldn't discourage you from checking it out, as it is very stable and usable. ▲

by Warren Ernst

Fork Prey 0.3.73

If your laptop is stolen, what are the chances you'll be able to get it back? If you haven't prepared for such an eventuality, then your chances are just about zero. But by installing a program like Prey on your laptop, your chances are, well, at least better than that.

Prey is a small background program that runs on Windows or Linux; there's an Android smartphone version, too. It regularly "checks in" with the Prey Web site to see if you've reported your device stolen. If you have, then Prey gathers information about your device's whereabouts via a few clever methods, snapping images from your Web cam, taking screenshots of whatever's on your display, and listing what files are open and what programs are running. This information

Prey 0.3.73

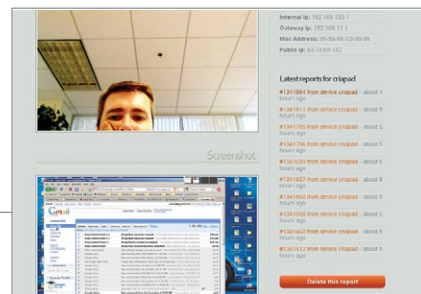
Publisher and URL: Fork, usefork.com

ETA: Q1 2011

Why You Should Care: Your stolen laptop will now do almost everything but call the cops to return to you.

is sent to the Prey control panel every few minutes (the default is 20, but we like five), and you can review all this information via a well-designed Web site. If you don't like being beholden to a Web site, you can also tell Prey to check any URL (such as one on your own Web site) to determine if it's been stolen, and it can email its reports to you.

Of course, this scheme only works if the thief a) doesn't reformat your hard drive immediately, and b) uses your computer to go online. As it turns out, a lot of criminals aren't too bright or cautious, so these requirements are met all the time.



With enough screenshots, it's likely you can learn the thief's email address, name, and Facebook friends. With Web cam photos, you can probably learn what he looks like. If he connects to an open Wi-Fi hotspot, you can probably obtain his rough location. Once you close in, you can tell your laptop to start making an alarm noise, and maybe you can retrieve your laptop. Brilliant! ▲

by Warren Ernst

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THE SMALLEST, YET MOST POWERFUL PC – IN THE WORLD

With the world's fastest processor (up to Intel® Core™ i7 980X), world's fastest graphics (up to NVIDIA® GeForce® GTX 480), and extreme memory (up to 16GB DDR3) inside, the Shuttle® J3 5800G is seriously faster than you can imagine.

For more realism and intensity than ever seen before, the Shuttle® J3 5800G also supports NVIDIA® 3D Vision when combined with an NVIDIA GeForce GT 240 or higher GPU – allowing you to immerse yourself into 3D games and movies like you've never experienced before.



Home Theater / Home / Office / Gaming
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UP TO SPEED

Upgrades That'll Keep You Humming Along

Mozilla released a number of updates across its higher and lower profile programs. Adobe issued its first update for the new Photoshop CS5. And, as you may have heard, Apple updated the iPhone OS with substantial new functionality.

Software Updates

Adobe Camera Raw 6.1

The latest version of the RAW digital file manager/converter for Adobe products adds support for new cameras, including Sony A450, Canon EOS 550D, and Olympus E-PL1 and E-600. A new lens correction feature can adjust for geometric distortion. Performance improvements boost the responsiveness of controls and scrolling.

www.adobe.com

Adobe Photoshop 12.0.1 For CS5

The first fix for Photoshop CS5 corrects several problems that degraded performance and caused crashes. An out of memory error that occurred while opening certain TIFF files has been fixed, as have crashes tied to using some fonts. Adobe claims the update also delivers improvements in 3D reflections, ray tracing, and IBL (image-based lighting) workflows.

www.adobe.com

Apple iPhone OS 4

Multitasking, the feature iPhone users have long been clamoring for, has been added to the latest version of the iPhone operating system. File folders have been added for users to more efficiently organize and navigate through their apps. Unified views of multiple email accounts are now supported, as well.

www.apple.com

Cerulean Studios Trillian Astra 4.2.0.20

The universal chat/IM client celebrates its 10th anniversary as its developer plans to

release a big version 5 update into beta soon. Until then, there is this large bug fix update to 4.2. Many of the fixes involve problems related to making changes to Windows Live/MSN Messenger. Crashes when signing into Messenger under specific authentication/reauthentication requests have been repaired, for instance. A problem prohibiting users with massive contact lists from signing into MSN is also fixed.

www.tillian.im

Hamrick Software VueScan 8.6.44

The digital scanner utility had several recent updates to fix problems with some HP and Canon network-attached scanners (v8.6.44), Epson's Expression 1680 (v8.6.43), and other devices. Version 8.6.41 enhances VueScan's cropping functionality.

www.hamrick.com

J. River Media Center 15.0.70

The longstanding multimedia playback and library software receives an "experimental" feature that will record digital television in .TS (Transport Stream) format. Faster thumbnail list loading, better toolbar and breadcrumb interfaces, and swifter view switching are among other improvements added to version 15.0.70.

www.jrmediacenter.com

Mozilla Firefox 3.6.6

The popular browser has been slightly revamped to give plug-ins more time to be nonresponsive before they're shut down. But the real magic behind this change is found in the earlier 3.6.4 update, which gave Firefox the ability

to isolate third-party plug-ins from the main program so that when they crash, Firefox can keep chugging along.

www.mozilla.com/firefox

Mozilla Thunderbird 3.1

Firefox's lesser-known cousin, this email client from Mozilla, boasts better message indexing to accelerate searches. The Quick Filter Toolbar helps filter tags, search terms, contacts, attachments, etc. Migration from Thunderbird 2 is easier with the unambiguously named Migration Assistant, a tool that lets users selectively enable Thunderbird 3.1 features as well as choose old version 2 settings to retain. The Mail Account Setup Wizard is preconfigured with a host of new ISP settings.

www.mozillamessaging.com

Opera 10.60

The alternative browser's JavaScript engine is now 50% faster than v10.5, according to Opera. Evolving Web standards HTML5 and WebM video receive improved support in this release. Geolocation is easier for Web developers now that Opera can prompt the users to share their location data with a site. Finally, search suggestions for some engines have been added to the Search box.

www.opera.com

SpeedFan 4.41 Beta 15

The fan monitor control tool for tweekers like us has updated support for W83627DHG, W83667HG, and W83667HG-B sensor chips and now supports W83677HG-I. The latest beta also boasts improved identification of Winbond and Nuvoton chips.

www.almico.com/speefan.php

Driver Bay

Creative Sound Blaster X-Fi 2.18.0015

These drivers are exclusively for Windows 7 but apply to most X-Fi cards. The drivers correct a flaw that causes shutdown delays of over two minutes.

support.creative.com

by Steve Smith

SHARK

The design of the Shark fan was inspired by the Shark's gill which depicts a great volume of water gulping through its mouth and forced out to the gill that transformed into speed and power.



AeroCool

www.aerocool.us

Each package includes:
1x voltage reduction cable (12V > 7V)
1x 3>4-pin connector
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Blue Edition
(4 x Blue LEDs)



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F6XT
THE GAMERS' COMPANION



Controls 6 sets
of fan speeds
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Touch-2000



Touch-1000



A "Must have" fan controller for gamers!

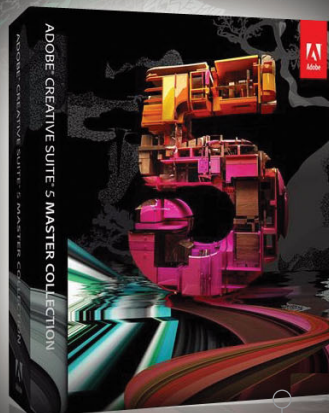


Authorized
dealers



Adobe Creative Suite 5 Master Collection

The Juggernaut Is Back



There are two kinds of computer users in this world: those who eagerly anticipate the roughly biennial updating of Adobe's Creative Suite (now at version 5, hence "CS5") Master Collection, and those who can't imagine any software being so good that it's worth the eye-popping \$2,599 retail price. If you fall into the latter category, there isn't anything anyone can say that will ever sway you, but then again, you also probably don't earn your living drawing artwork, editing photographs or video, creating Web sites, developing Flash applications, or generating large and complex documents. If you are someone who does these things professionally, however, then you're in a position to benefit from and actually enjoy using all the new features Adobe baked into CS5, which makes the retail price, if not less painful, at least justified.

So to these users we say this: Although not perfect, Adobe CS5 is the best yet, and you're going to want it regardless of price. We suspect Adobe knows this and has priced CS5 accordingly.

Some CS5 upgrades are simple evolutionary improvements, while others represent larger leaps. CS5 is a larger leap ahead of CS4 than CS4 was over CS3, as CS5 offers not only many nearly amazing new features but also a solid improvement in GUI simplicity and consistency across products. We saw hints of this with CS4, so thrifty and satisfied CS4 owners might want to save up for next time. CS3 owners, however, should strongly consider upgrading, especially because the upgrade price is a "mere" \$899, or about \$50 for each of CS5's 18 products. (Extra cost alert: Premiere Pro CS5 and After Effects CS5 require a 64-bit operating system, so factor in any additional costs that may be necessary to give your system the 64-bit treatment. However, both the Master Collection and CS5 Production Premium include Premiere Pro CS4, which will run on a 32-bit system.)

Budget-minded professionals can save some dough by selecting a version of CS5 that only includes the Adobe products they actually use. CS5 Design Standard (\$1,299/\$499 [full/upgrade]) comes with

Creative Suite 5 Master Collection

\$2,599 (full); \$899 (upgrade)

Adobe

www.adobe.com



Illustrator, Photoshop, InDesign, Acrobat Pro, Bridge, and Device Central. CS5 Design Premium (\$1,799/\$599) swaps Photoshop for Photoshop Extended and adds Flash Catalyst, Flash, Dreamweaver, and Fireworks. CS5 Web Premium (\$1,799/\$599) removes InDesign but adds Flash Builder and Contribute. CS5 Production Premium (\$1,699/\$599) includes everything except InDesign, Acrobat Pro, Flash Builder, Dreamweaver, Fireworks, and Contribute. Additionally, nearly all of the Adobe CS5 products are sold separately for between \$200 and \$1,000 with discount pricing for upgrades.

Suite-Wide Changes & Improvements

Before getting to the highlights of the main applications in CS5, it's worth

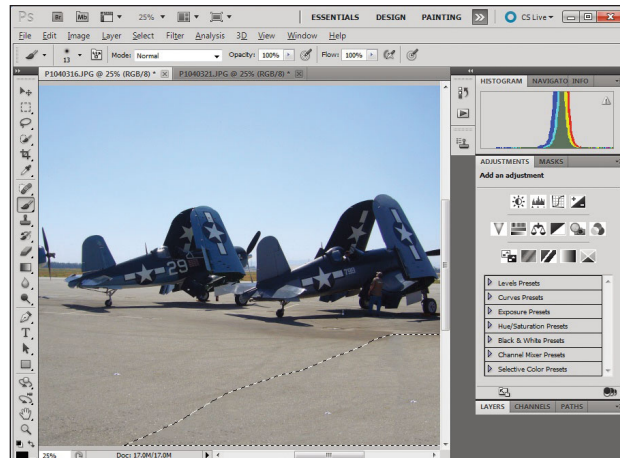
noting some changes shared between them all. All the apps feature big interface changes over previous versions, but frustratingly, they are occasionally implemented slightly differently between applications. Gone is the traditional Title Bar at the top of all the windows, which is arguably a waste of space anyway, replaced with Adobe's Application Bar. The left side of the former Application Bar frequently (but not always, maddeningly) has buttons that provide quick access to commonly used commands, such as launching Bridge or Mini Bridge (in Photoshop), displaying Rulers/Grids/Guides, changing the view magnification, arranging/splitting child windows, or changing fullscreen modes. Sometimes there are pull-down menus in the Application Bar instead.

The right side of the Application Bar displays the Workspace Switchers, which are basically collections of preconfigured and presized tool palettes, sub-windows, and toolbars especially suited for the kind of task you're working on. For example, Flash's Workspace Switchers "reconfigure" the Flash interface to Animator, Debugger, Designer, Developer, Classic, Essentials, and Small Screen modes. You can create and save customized Workspaces, too. This goes a long way toward putting just the tools and features you really need front-and-center, which is handy when these professional-level tools offer so much.

Sadly, however, some apps let you resize the Workspace Switcher, but others don't. Also, although snazzy looking, the all-gray Application Bar doesn't change color when an application window is active or in the background, so switching between program windows can sometimes be confusing.

All the main applications are now redesigned to make much better use of wide-aspect monitors, with tool palettes and properties windows that used to run horizontally along the top and bottom of windows now stacked vertically along the sides. In fact, if you're still using a single 4:3 monitor, you might feel a little constrained with CS5.

Finally, there are significant hardware improvements, which is unusual to say



when reviewing software. Specifically, the three main applications that can really benefit from lots of RAM, Photoshop, Premiere Pro, and After Effects, come in 64-bit versions capable of addressing dozens to hundreds of gigabytes of memory (depending on your OS limits), although there's still a 32-bit version of Photoshop available. Additionally, these three products take advantage of GPU-assisted image acceleration. If your system has an Nvidia GeForce GTX 285, Quadro CX, or Quadro FX 3800/4800/5800 (we couldn't find an official word on GF100-based cards), you can perform photo transformations, such as rotate or zoom, or video-editing functions, such as color correction or picture in picture, in real-time—no more hourglass icons for lots of tasks. Acceleration support for lesser Nvidia GPUs is apparently forthcoming, but time will tell if this pans out.

Of course, all the applications come with new features, which we'll highlight individually.

Photoshop/Photoshop Extended

With CS5, Photoshop is now 20 years old, yet it remains the best photo-editing software available. Period. Photoshop Extended, which is the version packaged with nearly all the CS5 suites, is basically just Photoshop with tools to manage photos in a 3D space, which is cute to say the least, but probably not the killer feature that will make you want to upgrade. (But there are those who will.)

If something like a fence intrudes on your photo, Content-Aware Fill makes removing it as easy as highlighting the fence and then choosing Fill>Content-Aware, and the surrounding background texture is used to seamlessly remove the selected item.

The stand-out new feature is what Adobe calls Content-Aware Fill, and it is used to remove unwanted items from the foreground or background of an image. Just use the Lasso Tool to draw a circle around the unwanted passerby, trash can, or other blemish, choose Fill, and then click Content-Aware; Photoshop analyzes the background colors and textures and almost magically removes what bothers you. Switch to the Content-Aware Spot Healing Brush tool and melt away flaws (such as birds or telephone wires) with pinpoint precision. And even when it "fails," it leaves you with a great starting point for manual retouching.

The other "OMG" feature is Puppet Warp. Imagine you've photographed someone whose arm is positioned awkwardly. Insert three virtual pivot points at the arm's joints, apply a surface mesh with a click or two, and then manipulate the arm like it was a puppet's. The tool can be incredibly fine-grained, but it can't create a texture out of thin air.

Toss in support for more cameras' RAW formats than ever before, noise reduction and addition (to add a grain), and new lens compensators, and it's clear that Photoshop is aging well.

Illustrator

Illustrator, like Photoshop, has been around for two decades, and perhaps more than any other tool, its effective use requires training and skill. As such, a lot of Illustrator's improvements come in the form of making formerly "very powerful tools" into "extremely powerful

tools.” Examples? How about the new Bristle Brush? Just configure brush attributes such as bristle stiffness and density, paint opacity, and brush shape and make brush strokes that look more like “real” brush strokes and less like digital lines. How about a new masking method called Drawing Modes? Select something and then choose Draw Behind or Draw Inside, and new strokes are masked either behind or within what’s selected, respectively.

Illustrator never handled the equivalent of Excel worksheets (called Artboards) well in CS4, and didn’t handle them at all previously, but CS5 lets you manipulate multiple Artboards with almost as much ease as manipulating layers. You can even copy and paste items between Artboards and export Artboards as individual Illustrator files.

How about the Align To Pixel Grid option, which forces thin lines to lie wholly within pixels when exporting bitmaps? If you’re a professional artist, then these things are major cool.

More casual users who struggle with 3D perspective will love the new Perspective Grid tool. Click it to create a 3D grid on the canvas, which can have its perspective manipulated by dragging around different vertices. Click the perspective “face” you wish to draw on, and then start drawing, and the objects perfectly snap to the perspective you’ve set.

Dreamweaver

With the popularity of content management systems such as WordPress, Drupal, and Joomla running even relatively small Web sites, you might think that the need for a full-featured HTML editor such as

Dreamweaver is growing smaller and smaller. Seeing the writing on the wall, Adobe gave Dreamweaver many new tools to keep it relevant.

The best is Live View with the accompanying Inspect tool. Dreamweaver now has a built-in WebKit-based browser, so if you point it at an HTML file or Web site, it displays the HTML in one child window while displaying highlighted live HTML code in another child window in response to mouseovers. Debugging complex HTML or CSS effects has never been easier, plus now you don’t need a browser and an HTML editor competing for screen space. If you’re running a CMS-based Web site, point Dreamweaver’s Dynamically Loaded Files tool at a generated page, and it instantly loads all of the pages’ building blocks into child windows, ready for editing. Dreamweaver’s enhanced PHP color-coding and code hints are big helps, too.

For static Web pages, there are lots of new tools, too, but the most important may be the free HTML5 Pack, which is a free download from Adobe. Once installed, it adds all the new HTML5 tags you’ve been hearing about, including <audio> and <video>, along with plenty of new HTML5 layouts in the New Documents dialog box.

Unfortunately, all these extra features use windows and palettes that really intrude on a small screen. Tellingly, there’s a Workspace setting for “dual screens,” but not one for “small screens.”

Flash Professional

The latest version of Flash receives lots of what we would call “minor enhancements”

that will solve some of the annoyances experienced Flash developers have been dealing with for years. It also boasts one huge new feature that had the rug pulled out from under it before anyone could really use it.

That huge new feature is the ability to save Flash executables as iPhone applications, meaning you can (could have?) create a GUI, add artwork, program in-application logic, and push and pull data from the Internet, and then compile an iPhone app. Unfortunately, the much-publicized change in iPhone development licensing locks out such apps from the official App Store, but there’s nothing precluding you from developing a little something for yourself. Look for similar functionality for creating native Android applications in the near future.

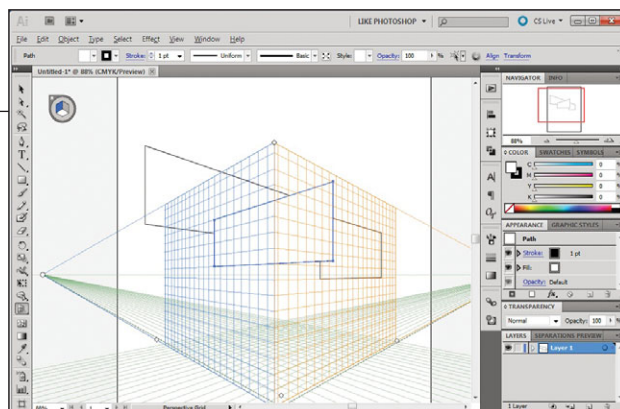
One huge headache-saver is Flash’s new support for Adobe’s Text Layout Framework, which allows for true threaded text blocks, complete with multicolumn support, real indentation, and inline graphics that stay with associated text strings. Video files now encode into proper Flash timelines during their initial import, and there are many new playback controls and options. There’s a new built-in physics engine that properly calculates and animates momentum and spring.

Despite the changes, Flash still works surprisingly well on a small monitor and still retains a degree of simplicity that encourages beginners to dabble in programming and animation.

Premiere Pro

We’ve already mentioned that Premiere Pro requires a 64-bit OS, and how it takes advantage of certain Nvidia GPUs for enhanced speed, but we didn’t mention that it is also now very multithreaded, and is therefore able to take advantage of as many cores your multicore CPU has. We were able to work with two layers of 720p video with CPU cycles to spare and basically no stuttering. This is all the more impressive because our test machines lacked one of the specific Nvidia GPUs required for Adobe’s Mercury Playback Engine to run at full throttle, meaning that the base

If drawing 3D items with perspectives has always flummoxed you, the built-in Perspective Tool will have you drawing perfectly aligned windows on 3D buildings in no time.



CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT



**WAKE UP TO THE DAWN
OF AUDIO AS A WEAPON**

PORTABLE SURROUND SOUND

THE PSYKO 5.1 PC GAMING HEADSET SYSTEM

For gamers, the phrase “5.1 surround sound” probably conjures simultaneous mental images of floor-standing speakers, crisscrossing speaker cables, and fragging

**“takes everything
you love about
6-channel
surround-sound
gaming and sticks
it on your head.”**

the guy who'd been stalking you none-too-stealthily as you headed for your favorite weapon spawn. No doubt gamers love anything that can provide a significant advantage on the battlefield, but five speakers and a subwoofer are a logistical nightmare for most game rooms,

and utterly out of the question for LAN parties. But the Psyko 5.1 PC Gaming Headset takes everything you love about 6-channel surround-sound gaming and sticks it on your head.

Unlike other so-called surround-sound headsets that use algorithmic DSP (digital signal processing) to create a false surround-sound environment, the Psyko 5.1 headset features two front speakers, two rear speakers, a center channel, and two subwoofer drivers (one for each ear) integrated into the cans and headband of the headset. Framing all those powerful but compact speakers is a system of waveguides that channel the sound from each speaker to the appropriate sides of your ears to generate a realistic

360-degree soundscape. Because every listener's ears are shaped differently, sound enters the ear canals in minutely varied ways. But rather than trying to fake it, the Psyko 5.1 PC Gaming Headset delivers raw sound to your ears as that sound would be coming at you if you were physically inside the game world, so you hear it as naturally as possible, with zero latency. This headset also trumps a traditional 5.1 surround-

**“This is immersion
like you've never
heard it before.”**

sound speaker system by making your head the sweet spot. This is immersion like you've never heard it before. Gamers notice they play better with Psykos because they

instantly know where every sound comes from.

The Psyko 5.1 PC Gaming Headset is dressed to impress with red, silver, and slate-gray accents that

**“pivoting ear
cups that ventilate
to keep your
ears cool”**

highlight the innovative technology that makes them unique. Other features include a standalone volume and bass control box, an LED-based 5-channel directional indicator, pivoting ear cups that ventilate to keep your ears cool and vertical sliding cans for the perfect fit, and a detachable mic boom. The Psyko 5.1 PC Gaming Headset is \$299. **!**

software is much more optimized than CS4 ever was. Given the right hardware, we expect the levels of filter speed and real-time fluidity to be nothing short of awesome.

Also under the hood, as it were, is support for many more native video formats from pro-level camcorders and D-SLRs. Premiere Pro can now automatically detect scene breaks. Exporting abilities are also vastly improved, with preset pixel aspect ratios, frame rates, and other settings for popular outputs such as DVD, Blu-ray, television, and even popular portable devices, plus the status indicators during lengthy outputs are more informative. And, of course, there's tighter exporting integration with Flash, Encore, and After Effects.

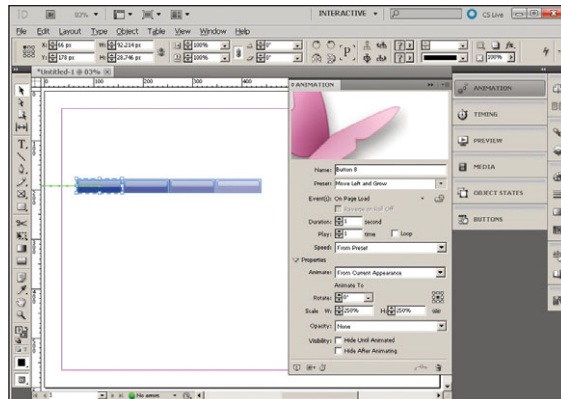
InDesign

Everyone knows about QuarkXPress' and InDesign's battle for dominance in the printed design world, but it's easy to forget that both have been also fighting for the hearts and minds of those who design for online consumption. With CS5, InDesign takes the lead in this race. When set to either the Interactive or the Interactive For PDF workspaces, it feels a little bit like Flash reskinned for classically trained designers, since there's no sign of the potentially unfamiliar Flash timeline. Animation options are available from pull-down menus, including Fade In, Grow Large, or the more exotic Swoosh and Wave. Thusly, InDesign now makes a credible prototyper for online content, and its ace in the hole is its ability to export directly to Flash's FLA format if finer details need ironing out.

On the print side of things, InDesign finally allows for different page sizes within a single document. InDesign's tracking of layers and objects now mirrors Illustrator, which offers more power and greater ease.

Flash Catalyst

Flash Catalyst is new for 2010, and to a certain extent it shows. FC feels a little bit like a standalone application (perhaps like a very young Flash?), but its main



Animations with InDesign? Yup. Select an item you want to animate, bring up the Animation tool, and select an animation from the list—no programming knowledge or animation theory necessary.

reason for existence is to grab essentially static files from Photoshop, Illustrator, and Fireworks and transform them into online interactive sites or applications with a bare minimum of programming.

Why not just use Flash itself for this sort of thing? The big reason is what Adobe calls "Roundtrip Editing": As you drag and drop elements from other programs into Flash Catalyst, those elements can be edited by their original application at any time, and the changes are brought into Catalyst automatically.

There's no doubt it works, and it's a boon for users who are unfamiliar with Flash or InDesign. That said, Flash and InDesign both offer much more overall power and flexibility.

Encore

Encore CS4 introduced Blu-ray Disc authoring capability, so where does Adobe's disc authoring application go for CS5? Why, disc-less disc authoring, of course!

Encore CS5 introduces Web DVDs. Web DVDs are authored just like regular discs, complete with menus, background images or movies, background audio, and so forth, but there's one big difference: no discs. Instead, the Flash-based construct is put online and accessed via Web browser. The point of Web DVDs is to present videos, which are also online in the form of Flash's FLV format.

For those still authoring actual discs, Encore now employs Premiere's 64-bit

Adobe Media Encoder, and it runs in the background while you keep working on the menus, cutting the overall authoring time substantially in most situations.

Fireworks

Fireworks has always been the old Macromedia product Adobe never seemed to know what to do with, since in its former life it basically competed with Photoshop and Illustrator. As such, Fireworks development lately seemed somewhat stagnant. But fans of Fireworks can breathe a sigh of relief: It's never looked or acted better. Plus, more than 900 bugs have

been quashed in this latest version, and it receives the full CS5 interface treatment, as well.

Fireworks was initially created primarily for building graphics for Web sites, using a blend of both bitmaps and vector graphics, and the latest version is really better than anything else at this. Its export options for Web-friendly formats are expansive and flexible.

Though there are no new killer features in Fireworks, there are numerous small and welcomed changes. The new Gradient Dither control virtually eliminates the irksome color banding older versions of the control spit out. Multi-page PNG files can have pages copied and pasted between them. The program is significantly speedier to launch and apply filters. And, finally, it can export objects or entire Fireworks documents directly to Flash with all their editable attributes intact.

Worthy Of Upgrading?

So the \$900 question: Is CS5 worthy of your upgrade dollars? If you're a professional, then the answer is a fairly unqualified "absolutely yes." For casual users and amateurs, the answer really boils down to whether the new killer features will save you enough time and effort to offset the upgrade price. We hope we've helped all on the fence to decide. ▲

by Warren Ernst

Xara Web Designer 6

There are basically two ways to create Web 2.0-esque sites these days: 1) you install/buy space on a server with a CMS (content management system) such as Drupal or WordPress and then learn how to use it; or 2) you learn HTML/JavaScript or jQuery/Photoshop/Flash, buy a bunch of expensive programs, and you learn how to use them. The common factor is that you need to learn how to do *something*.

Xara is hoping that Web Designer 6 will be a third popular way to create modern sites, because you don't have to learn any HTML, scripting, Flash, or other tools to create Web 2.0-like sites. We found all this to be true, and some of WD6's features are almost magical. But to get the most out of it, you need to learn something that is still pretty complex: a full-featured design tool.

WD6 is more like a desktop publishing program than an HTML editor. This is a plus and minus. You may remember all the terrible-looking and poorly written

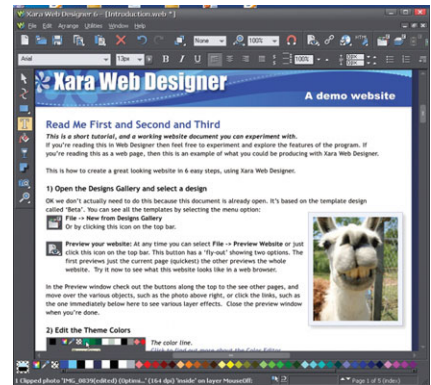
newsletters that resulted from everyone owning PageMaker and thinking they were graphic artists. WD6 is the modern equivalent, but it produces Web 2.0 Web sites instead. It is a surprisingly complex tool stuffed with powerful features that take time to absorb fully.

And many of the features are amazing. Drag photos or graphical elements around the page, and text reflows. Add smart widgets such as live Google Maps or PayPal "Buy It" shopping cart buttons, and things just work. Add jQuery-like effects such as pop-up image thumbnails and cascading menus with a few clicks. Utilize dozens of templates and color themes for a professional look . . . or at least "almost professional." We generated "almost professional" sites pretty quickly; it took time and effort to get the last 5% looking perfect.

By the time you've learned how to do everything with WD6 and generate polished results, you may have been able to

learn a CMS or some HTML. WD6 is best suited to those who find coding, not complexity itself, confusing. ▲

by Warren Ernst



Web Designer 6

\$49

Xara

www.xara.com



CyberSynchs 0.9.0

With modern smartphones storing as much personal data as laptops did only a decade ago, backup options are important. In a perfect world, your device would automatically back up all of its data to a remote server that's easily accessible from any Web browser. If you lost your device, then there should be some way to easily restore your data to a new one with minimal hassle (extra points for locating a lost device and/or wiping its memory). On paper, CyberSynchs meets these requirements, but problems with execution, a bizarre Web interface, and a certain amount of redundancy from competitors make it hard to recommend the software at this time, even taking into account its "beta" status.

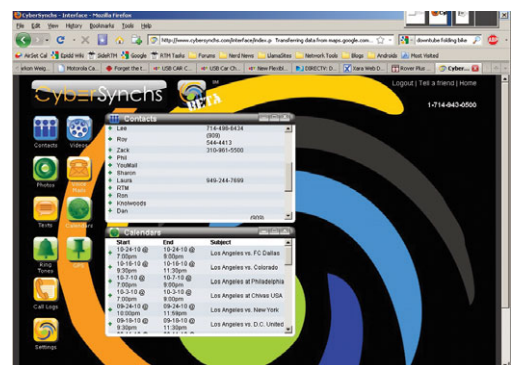
CyberSynchs works with Windows Mobile 5 or later, Android, BlackBerry, and Java, with support for iPhone and Palm OS (we don't know if they really mean webOS) "coming soon." It supports the backing up of (at least for Android, which is the version we tested) contacts,

calendars, ringtones, photos, call logs, texts, GPS, and videos all "over the air" or via a Wi-Fi connection. Backups are actually two-way synchronizations, meaning you can work with your data on CyberSynchs' Web site and changes are pushed back to your phone, and they either sync on a regular schedule or only when you manually press "Sync."

The initial sync (with a phone admittedly stuffed with content) stalled out after 45 minutes "over the air" and never really finished over Wi-Fi, ignoring videos and texts. Subsequent synchronizations worked when we disabled these elements. Working with our data on CyberSynchs' Web site was . . . odd. It duplicates a desktop metaphor, with movable icons for contacts and such. Double-clicking an icon opens a draggable window with your content, but the process is slow and clunky; a more basic interface would do here.

Ultimately, such flaws would be fine for a free product, but at \$2.99 a month, we think Google Sync (available free on most platforms) is almost as thorough and much more reliable. ▲

by Warren Ernst



CyberSynchs 0.9.0

\$2.99 per month

CyberSynchs

www.cybersynchs.com



OrdinarySoft Start Menu 7 Pro

Rather than confining the Windows Start menu to the lower-left corner of your screen, Start Menu 7 aims to take up most of your display with all of your Start menu's buried contents. When you click Start, SM7 shows all of your applications and app folders arranged alphabetically. When SM7 can detect the main executable within a program folder, it will make the executable's icon symbol visible; otherwise, you'll see a folder icon. Either way, holding the mouse over the object will spawn any available fly-out options. Alternatively, if you press the Windows key on your keyboard, SM7 will offer keystroke tips for shortcutting through the UI.

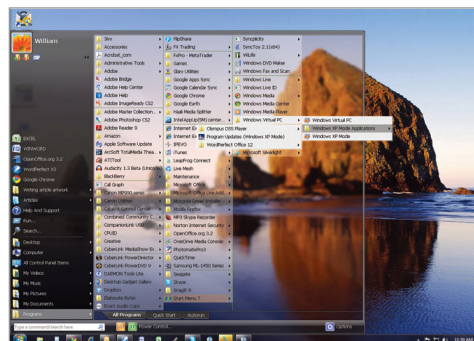
One of the main ideas behind SM7 is that our brains associate objects (such as applications) with spatial relationships (such as a location on a Start menu). However, one of the reasons why the Windows Start menu is hard to use is because the location of objects within the menu changes over

time. At first, we were perplexed by the loss of the Most Frequently Used Programs list that appears above the Start button. Then we realized that between pinning the most common apps to the Taskbar and using SM7's Add Items function to add program shortcuts, commands, and folders to the list in this space, there was no reason to foul up the static dependability of the UI with a changing apps list. And we love having one-click accessibility to folders in this spot.

The free version of SM7 will give you the flavor of the revamped menu system, but it lacks the single-click launching and tabbed lists (along the bottom) that make the program so powerful. Now, having adjustable background opacity would've made the menu text more readable, and sometimes, the right side of the screen can get cramped with overlapping fly-out lists. Also, \$10 seems a fairer price for a program that, if

we're honest, only exists to save you a few seconds every so often. Still, SM7 clearly trounces Microsoft's default Start menu if you're the function-over-form type. ▲

by William Van Winkle



Start Menu 7 Pro
\$19.99
OrdinarySoft
www.startmenu7.com
●●●●●

Bolide Software All My Movies

One of the best lessons a person could learn from Apple is that a product should be just as functional under the hood as it is fun to use and look at. All My Movies does fairly well on the first count. The program aims to be a one-stop catalog for your entire video collection, from VHS to HDD-based files to Blu-ray.

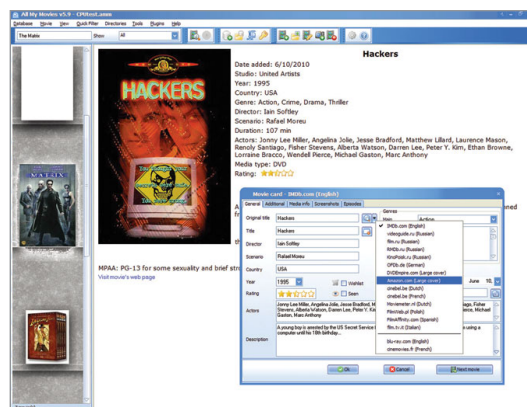
Let's be honest: You're really only interested in using software such as AMM to catalog your movie library. So with that said, the English language metadata used to tame your collection is pulled from IMDb.com (the default), DVDEmpire.com, Amazon.com, or Blu-ray.com. We don't fault Bolide for the inexhaustible errors in its third-party providers' metadata, only for making it so hard to isolate the right record in the first place. Say you want to add the Blu-ray release of 2005's "Serenity." You click the Add New Movie button to bring up a blank "movie card" and enter "Serenity" in the Original Title field. The Results pop-up window shows

results straight from an IMDb search, which makes a lot more sense on IMDb's page than it does here because you can see the tiny thumbnail of the Blu-ray cover and know that's the correct link. In All My Movies, what you see for the same hit is "Serenity (2005) aka 'Serenity - pögenemine uude maailma' - Estoniaaaka. . ." You also get hits for movies named Serenity from 1999, 2007, and 2008, along with other potential false leads. If you (correctly) pick the first hit, you still have to pick from a second screen of possible Serenity versions, including the "Firefly" TV series and a bunch of other movies with the word Serenity in their titles.

You get the idea. Now, the program does have some nifty features, such as tracking people to whom you loan your videos and the length of their borrowing period. You can scan your system for movies, export your

database, and filter your catalog in several ways. But nothing makes amends for the subpar record entry methods, Windows XP-era GUI, and \$45 price tag. ▲

by William Van Winkle



All My Movies
\$44.95
Bolide Software
www.bolidesoft.com
●●●●●



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CORSAIR DOMINATOR RAM
AMD X6 CPU
ATI 5970 GPU
COOLERMASTER ATC 840**



www.SmoothCreations.com



Yeah, we know you have blogs to post, video to encode, reports to write, and code to compile. We do, too, but you have to take a break once in a while (and maybe blow some stuff up). That's why each month we give you the lowdown on what to expect from the latest interesting PC and console games.

CPU
Game Of The Month



\$59.99 (X360)

ESRB: (M)ature

Microsoft Game Studios

www.crackdownoncrime.com



Leap Tall Buildings, Again—by Chris Trumble

More than three years have passed since we first stomped around in Pacific City in the shiny armor of a superhuman agent, and it's nice to be back. Of course, things have changed; the various gangs scrapping over turf and influence in the hopelessly corrupt city have given way to two primary sources of danger. The first is an anti-agency terrorist group called the Cell whose tactics resemble those of the former criminal gangs, but whose motives appear to be more political in nature. The second is a growing mass of human mutants known as Freaks.

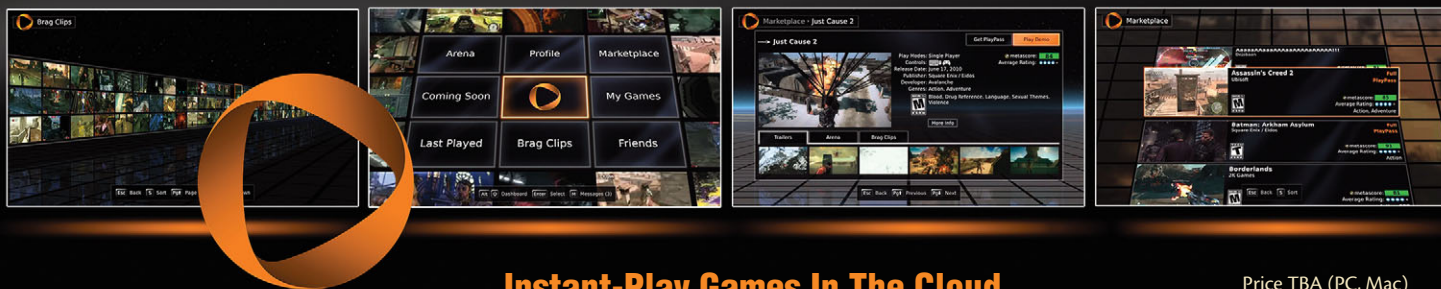
In the early stages of the game, you quickly notice the pattern that has become the heartbeat of Pacific City: By day, the streets are populated with a few hapless citizens and swarms of well-armed Cell forces. As day gives way to night, however, the Freaks emerge from subterranean nests to take over the streets. The solar cycle moves along fairly rapidly, and this provides a nice slice of variety to the game. While you work on achieving the objectives handed down by the agency, you'll need to alter your tactics slightly as the sun rises and sets, as the weapons that are most effective against Cell jerks are much less effective when fighting Freaks, and vice versa.

As in its predecessor, Crackdown 2 lets you develop your agent's speed and jumping prowess by collecting the agility orbs scattered all over the city, and you skill up your combat skills by using various weapon types. The valuable hidden orbs are back, as well. You begin as a pretty tough dude in intimidating armor, but as you gobble up orbs you progress from tough guy to superhero. The payoff for agility

upgrades, and the ability to leap across tremendous distances and to dizzying heights, is one of the main attractions in Crackdown, and it just never gets old.

Mission objectives are fairly vanilla, and you won't get a lot of story development throughout the game. In fact, Crackdown 2 is sort of the polar opposite of Alan Wake in this regard. Whereas in Alan Wake the story is rich and engrossing but dictates your pace and gameplay style, Crackdown 2 gives you precious little in the way of narrative development but turns you loose to indulge in whatever form of urban pacification tickles your fancy.

In addition to adding the zombie-like Freaks (and I challenge you to name one thing that isn't better with zombies), Crackdown 2 improves on the first game in a number of key ways: New guns, new vehicles, a much-improved four-player co-op experience that adds considerable depth and replay value, and better driving mechanics from the start. Add these improvements to the sheer joy of bounding from rooftop to rooftop like S.W.A.T. Team Hulk, and you get CPU's Game of the Month. ▲



onLIVE®

Instant-Play Games In The Cloud —by Dr. Malaprop

Price TBA (PC, Mac)

ESRB: Varies By Game

OnLive • onlive.com

OnLive is a games-on-demand, cloud-based streaming service with a client for the PC and Mac. The small client, once installed, lets you jump swiftly between games more quickly than consoles or even locally installed computer games. Members pay a monthly fee for the OnLive service and then additional fees to play games. For example, *Batman: Arkham Asylum* features two PlayPass purchase options: five days of play for \$6.99 or three days for \$4.99. *Assassin's Creed*

II only features a Full PlayPass for \$39.99. Purchasing a Full PlayPass lets members have full access to a game through at least June 17, 2013. Initially, pricing for the OnLive service was \$14.95 per month, but an OnLive spokesperson says \$4.95 per month is a better guide moving forward. Pricing had not been finalized as we went to press.

One drawback is that if you leave the service you lose access to your Full PlayPass purchases. Other drawbacks

include a client that doesn't currently let you use OnLive over Wi-Fi (at least not without a bridge work-around), graphics that are visibly less detailed than top-notch PC graphics, and a limited library of games. That aside, we were impressed at how well games played considering they were being processed in the cloud and streamed to us. Lag seemed negligible. Also impressive was how well games, such as *Assassin's Creed II* and *Tom Clancy's Splinter Cell: Conviction*, played

on an older Intel Core 2 Duo laptop with integrated X3100 graphics.

OnLive delivers a platform that lets casual and more budget-oriented gamers play games they might not have been able to enjoy otherwise. Now you don't have to upgrade to the latest and greatest in PC hardware to play fairly recent, graphics-heavy titles. Serious players, however, should stick to retail box copies or Steam for the newest games and best visuals. ▲

SINGULARITY

It's About Time—by Dr. Malaprop

Finding an unexpected gem is always a pleasure. *Singularity* has you playing as Captain Nathaniel Renko in the mid-1950s. You're a military operative sent to see what's happening on the island of Katorga-12. It's not long before mutant creatures and Russians enter the picture and make life complicated. *Singularity* starts as a very traditional FPS but opens up once you find the TMD (Time Manipulation Device).

The TMD attaches to your hand and lets you move objects back and forth through time, which changes the state of said object between old and new. For example, an old crushed box in a new state is higher off the ground, which lets you climb or jump onto areas or force open doors.

Your time control powers let you age enemy soldiers into dust, create time bubbles around enemies to slow them down, reassemble staircases to access new areas, restore boxes to get health and ammo, and

guide your sniper rifle firepower into hard-to-hit enemies. You can even slow time down enough to steer the bullets into a previously nonvisible area. Along the way, you can find chalkboards and blueprints to upgrade your health, weapons, and abilities.

Singularity does an excellent job of mixing things up, and for a game that's so strongly based on old-school principles, it rarely feels repetitious. Included are two multiplayer modes equivalent to team deathmatch and class-based capture-the-objective. Here you'll take turns as humans and mutated creatures. Visually, this is not a graphical powerhouse. However, it's very atmospheric and gobs of fun. The time travel mechanic falls apart if you think too much about it, but like any good summer movie, *Singularity* is meant to be a thrill ride—not an Oscar contender. ▲

\$59.99 (X360, PS3); \$49.99 (PC)

ESRB: (M)ature • Activision • singularity-game.com



TRANSFORMERS

WAR FOR CYBERTRON

One Shall Stand, One Shall Fall—by Josh Compton

\$39.99 (PC); \$59.99 (X360, PS3) • ESRB: (T)een • Activision • www.transformersgame.com

Long before the Transformers came to earth, a war was waging between the Autobots and Decepticons on their home planet of Cybertron. In *Transformers: War For Cybertron*, a third-person shooter, the Transformers license is put to good use as you play through two campaigns, set before the Generation 1 storyline, and use many of your favorite characters in the process.

WFC includes platforming and driving elements to vary gameplay. You can transform at any time, which provides multiple ways to attack objectives. The controls work great for the most part with driving being the only minor weak point that will take time to get used to. You'll have multiple weapons to choose from, and each has its own distinct feel.

There are many multiplayer components ranging from your classic slayer to WFC's version of Horde mode called Escalation, which is a blast to play. You can customize your character with different classes, upgrades, and perks. The multiplayer experience feels inspired by Unreal Tournament but definitely has its own identity.

The Transformers license has had a rough time lately with the second Michael Bay movie and multiple tie-in games not reaching their potential. *War For Cybertron* avoids those pitfalls and delivers an experience that should please longtime fans and newcomers alike. ▲



DEAD TO RIGHTS

RETRIBUTION

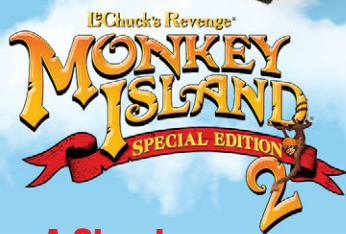
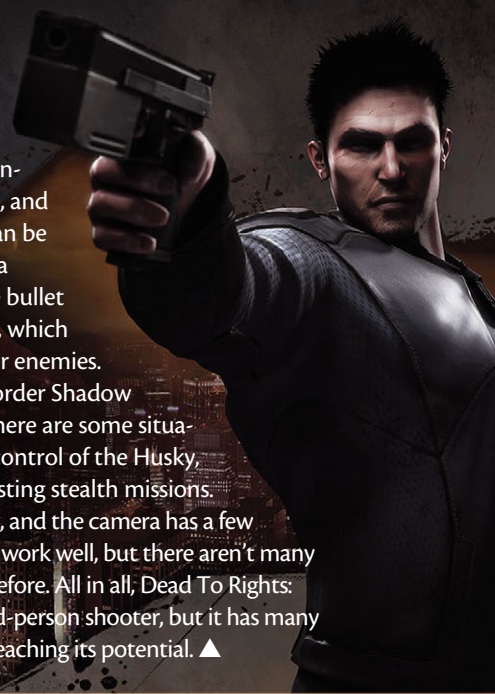
A Man And His Dog—by Josh Compton

For those of you familiar with the *Dead To Rights* series, you may remember the first one being a reasonably enjoyable arcade shooter. Volatile games took it upon themselves to create a reimagining of the first game, and the results are similar.

You play as Jack Slate with his K-9 partner Shadow patrolling the streets of Grant City. You will use hand-to-hand combat as well as weapons to defeat enemies throughout the 10-plus levels. There are some cool moments where you perform takedowns that disarm enemies.

The goal is to end every conflict as violently as possible, and some of these moments can be pretty rewarding. There is a Focus meter, similar to the bullet time feature in *Max Payne*, which fills up as you take out your enemies. Although you can always order Shadow around using the D-pad, there are some situations where you can take control of the Husky, in what amounts to interesting stealth missions.

The graphics aren't great, and the camera has a few issues. Most of the controls work well, but there aren't many features you haven't seen before. All in all, *Dead To Rights: Retribution* is a decent third-person shooter, but it has many flaws that prevent it from reaching its potential. ▲



A Classic Adventure Remastered
—by Dr. Malaprop

\$9.99 (PC);
\$10 (X360, PS3);
\$7.99 (iPhone)

ESRB: (E10+)veryone 10+

LucasArts

lucasarts.com/games/monkeyisland2

In the November 2009 issue of *CPU*, *The Secret of Monkey Island: Special Edition* made our Game Of The Month. The sequel ups the ante with better pacing, humor, and other improvements. As the game opens, we find our hero, Guybrush Threepwood, dangling from a rope and clutching a treasure chest. He begins recounting how he ended up in this predicament, and you play through the tale.

LeChuck's Revenge was originally released in 1991, and, as one of the best point-and-click adventure games ever created, we're not surprised at how well the gameplay holds up nearly 20 years later across so many different platforms thanks to new voice work, musical score, reimagined HD graphics, and in-game hint system. Switching seamlessly between the original and HD views never gets old, and the Mystery Science Theatre 3000-style commentary track is a great addition.

Purists may be disappointed by missing content from the classic version of the game (for example, the intro sequence and those humorous line items in the credits). This doesn't affect gameplay, but we think it was a poor "remastering" choice for such a classic game. ▲



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GREEN DAY ROCK BAND

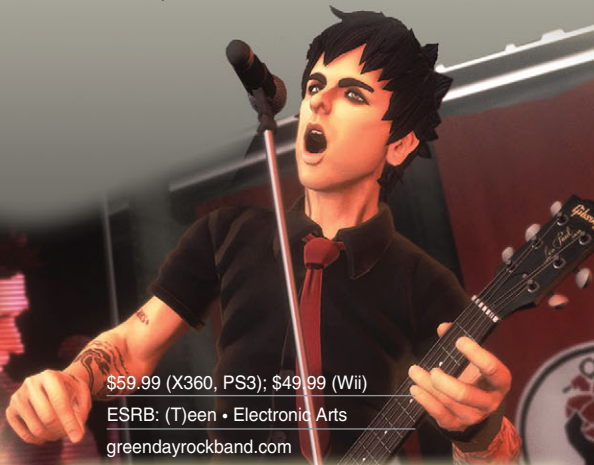
For Fans Of The Band

—by Dr. Malaprop

We enjoyed playing through The Beatles: Rock Band last winter. Now we have another dedicated release for Green Day, which focuses on the band's most important songs through the beginning, middle, and current portion of its career. The 47 tracks are comprised of the first two albums, Dookie (1994) and American Idiot (2004), in their entirety along with tracks from 21st Century Breakdown (2009). The rest are available as DLC. Seven additional hits spanning Insomniac, Nimrod, and Warning are included.

Each of the three albums is linked to a phase in the band's career and a concert venue. There are only three locations, which feels light. The motion capture for each phase is spot-on, but the variety falls well short of what Harmonix did with The Beatles game.

The deciding factor to pick up Green Day: Rock Band is based on how much you like Green Day. If you're the kind of person who purchases Green Day songs, would want to see the band live, or jam out to its radio songs, then buying this game with all its bonus material (photos, footage, and more) is a no-brainer. ▲



\$59.99 (X360, PS3); \$49.99 (Wii)

ESRB: (T)een • Electronic Arts
greendayrockband.com



The New Xbox 360

Silence Is Golden — by Dr. Malaprop

The glossy, black, revamped 360 is noticeably slimmer and runs more efficiently than its predecessor. The DVD is audible but not as noisy; generally, the hardware is nearly silent. Power requirements dropped thanks to a 45nm chip refresh, so the power brick is now a smaller power block. The kit won't RRoD because Microsoft removed the red LEDs, but if the new design finally remedies the 360's reliability issues, no one should miss the red lights nor care about Microsoft's return to a one-year warranty from the former three-year plan.

Buttons on the front are now capacitive-touch sensitive. Microsoft integrates 802.11n, outclassing the Wii and PS3. There's also a new removable 250GB hard drive in a proprietary shell. The dual Memory Unit slots are gone, so original 360 MU cards are incompatible, but USB flash keys work with both generations. The back is similar, adding a separate optical-out port along with a new port for connecting the Kinect directly to the console without an external power source. Best of all, the refresh gives you more hardware at the same price and nicely tees up the 360 for another five years. ▲



\$299.99 | CPU RATING: ●●●●● | Microsoft | xbox.com/hardware

SPLIT/SECOND

Better TV Through Destruction — by Dr. Malaprop



\$59.99 (X360, PS3) • ESRB: (E10+)everyone 10+

Disney Interactive • disney.go.com/disneyinteractivestudios/splitsecond

On their surfaces, Split/Second and Blur (also reviewed in this article) look similar, but they are different racing beasts. Blur is about karting and snagging power-ups to attack opponents. Split/Second is a game show arcade racer that lets players dish out damage to opponents via the racing environment.

In Split/Second you'll drift, draft, and jump to boost a three-tier power meter, which lets you enable environmental destruction along the race track. A first-tier boost lets you trigger small events, such as helicopters dropping bombs on opponents or cranes swiping the road. Higher-tier boosts let you trigger sending

jumbo jets careening head-on into traffic, sliding huge cargo ships across the track, and toppling freeways. The cars are not licensed; the heavily destructible environments are the true star of the game.

Dishing out damage works best when you have cars ahead, so it's no surprise that taking pole position never feels as satisfying as being behind. You can out-drive attacks the AI or other players launch, but you don't have formal defensive moves. There's a great feel for speed, and the game is visually excellent. Multiplayer is a blast, which is good for anyone seeking their long-term money's worth from Split/Second. ▲

ARMOR A90

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ARMOR A60

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Tired of having to compromise with average PC chassis that doesn't provide enough cooling for today's high-performance components? Continuing Armor Series' elite-class cooling performance and rugged structural integrity with unique styling, Armor A90 gaming-grade mid-tower chassis is positioned to change all that and redefine the way you look at today's high-performance chassis. Innovative Cable Management technology allows PC enthusiasts or hobbyist alike to easily manage and simplify cable clutter within the computer to increase thermal efficiency. Performance cooling is made possible by integrating an oversized 200mm blue LED top exhaust fan, a rear mounted 120mm exhaust TurboFan and a front 120mm blue LED intake fan. Uniquely styled with side see-through window to show off your components and work including fully black-powdered interior.

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Social Gaming Starts Playing For Keeps

Have you tended your online farm this month? More than 60 million Facebook users did on FarmVille; probably some of them are friends of yours. Whacked a rival gang member lately? Well, more than 18 million people last month were managing their crime families on Mafia Wars. Or, have you bashed the reputation of your BFF? If you've joined Sorority Life, then you know that this is the sort of college hijinks you can expect, sometimes 20 (or more) times a day. From managing a pet community in PetVille to posting high scores in Bejeweled Blitz, there now seems to be an addictive social gaming experience available for every imaginable audience on Facebook, as well as other social networks, such as hi5 (hi5.com) and MySpace.

While the rest of the economy dozed over the last two years, the market for games running atop social networks experienced some of the most explosive growth anywhere in media. And yes, those numbers are real. Zynga's FarmVille has more monthly users than most major media Web sites. And according to industry chronicler InsideSocialGames.com, the top 10 most-played games on Facebook boast well over 10 million players each month.

Traditional media are taking notice and ponying up serious bank for this social gaming phenomenon. In late July, Disney acquired one of Zynga's most formidable rivals, Playdom, for over \$550 million (with incentives for another \$200 million if Playdom's market share expands enough).

Online multiplayer gaming has been with us for many years, but "social gaming" is really a different category altogether. Running on the social networks such



as MySpace and Facebook, which hundreds of millions of people already use, these in-browser games are immediately accessible. They usually involve addictive real-time simulations or role-playing experiences that require a lot of maintenance, cooperation, or competition among gamers. Often your in-game achievements or needs are broadcast to all of the friends in your personal network, which tends to intrigue and recruit new players in a hyper-viral way that can make some games become fast hits.

In fact, it is this combination of broad accessibility, addictiveness, and viral distribution that has driven staggering growth. Additionally, many players spend real money buying virtual goods to enhance gameplay experience, creating a new social network economy.

"We are in a situation where . . . you are tracking a billion-dollar industry being created overnight," says Christa Quarles, CFO of Playdom (www.playdom.com), maker of Sorority Life and the Mobsters series. Social gaming is a game of sheer scale. In a ThinkEquity report on social gaming, 79 million people in the United States will play these games by 2012. The revenues produced from these games, a combination of virtual goods payments and advertising, is expected to exceed \$2 billion in 2012, according to ThinkEquity.

The 800-pound gorilla in this market is venture capital darling Zynga (www.zynga.com), maker of the most-played social game of them all, FarmVille, as well as most of the other top titles on Facebook. Up to 17 million people a day play FarmVille on Facebook. Zynga has secured hundreds of millions of dollars in financing, including a major partnership with Google.

But the social games industry is maturing very quickly. Hundreds of developers cropped up in 2009 to capitalize on the emerging craze, but much of 2010 saw consolidation in the industry as Zynga rivals such as Playdom started buying up smaller companies to achieve competitive scale. Console gaming giant Electronic Arts acquired social gaming company Playfish last year.

PopCap: How 'Social' Changes The Game

Social gaming's stunning rise took a lot of old pros by surprise, even savvy downloadable game maker PopCap (www.popcap.com), whose Bejeweled and Plants vs. Zombies are monster hits across a number of platforms. "We stumbled into social gaming, to be honest," says Jon David, VP of Social Games for the company. Several years ago, David and a small

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team tried making a “viral” version of Bejeweled in which players of the game used email exchanges among players to challenge one another with their high scores. In late 2008, they moved to a simple Facebook version of the game and released it just before Christmas. There were 19 users on the first day, but soon the viral effect took hold as friends of friends saw one another playing. By the time the team returned in January, the growth was exponential: Thousands were already on board. Bejeweled Blitz, the social gaming version of the classic, has now been played by 30 million people on Facebook and attracts over 10 million a month.

“In the last 24 hours, three million people have played,” David says.

And although most social gaming is free, the business is driven by about 1 to 3% of users who do buy virtual currency for upgrades and special items. According to Quarles, when people spend money on social games “they are really in . . . and they pay more than you would think compared to other forms of entertainment.” In industry parlance, gamers who spend more than \$1,000 a year are dubbed “whales,” although a much larger share of heavy spenders are dropping \$25 a month on social gaming. Similarly, PopCap uses its social games to promote its fee-based downloadable titles. “We have seen a huge lift in traffic to PopCap.com,” David says.

Social gaming also changes the way companies such as PopCap make and manage their titles. Traditionally, PopCap had small teams of five to eight people focus on a single title for a year or two and then move on to the next potential



In social network gaming, it's all about scale, and market leader Zynga is happy to boast about the millions of gamers and games it serves every day.

hit. But running a social game “is a living, breathing service,” David says. As millions of people come on day and night, “operations need to scale. This is not what we had done as a company.” A small group still prototypes a new design, but now 12 to 15 people build a server infrastructure around the design so that it runs efficiently on the social networks.

Little things matter, such as how often you update a player's status on the server and then send achievement notices to the player's friends. PopCap's Bejeweled Blitz servers used to store only the user's high score for the week, but to improve the viral nature of the game, PopCap has added medals of achievement that must be updated in real time.

“A small design decision can add millions of server hits. That decision has had huge implications when you are dealing with this sort of scale,” David says.

According to Quarles, when people spend money on social games “they are really in . . . and they pay more than you would think compared to other forms of entertainment.”

After Facebook?

Perhaps the most striking aspect of social gaming is how much of the industry currently depends on a single platform, Facebook, which is itself a relatively new company that is changing the rules and business models for new and old game companies. Traditionally, social game developers on Facebook relied on “app notifications” from a gamer going out to his friends via the network's news feeds. After complaints that games effectively spammed users with too many game status updates, Facebook implemented a new policy in recent months that gives players more control over the notices that go out. This produced the side effect of a number of titles losing users as the games lost some of their viral effect.

Facebook is also trying to get a bigger piece of the billion-dollar social gaming business by creating a new Facebook Credits virtual currency system that can be applied to any game. Facebook takes 30% of revenue and passes the remaining 70% to the publisher.

“In the short term, there will be a patchy road,” David says, “but [Facebook] is trying to build a well-greased, frictionless e-commerce system. The lift for us will be far higher than the revenue split they are discussing.”

But Facebook's own halting march into gaming leaves the field open for competition and lets publishers explore other venues. Google is reportedly planning a social games offering later this year, and Yahoo! has cut a deal with alternative payment system Offerpal (www.offerpalmedia.com), which will let app users earn credits in exchange for things such as viewing advertising. Facebook rival hi5 recently hired gaming legend and former WildTangent head Alex St. John to redirect its social network more toward gaming and entertainment.

Although none of the game developers want to defy a social network that has “accidentally” built a billion-dollar market in less than two years, many publishers are understandably wary of tying their fortunes to a single platform.

"Everyone is exploring whether being 100% on Facebook is the best thing," Quarles says.

Just as social networking has become an important mainstay of mobile data use, publishers are hoping that the smartphone versions of their franchises will offer new business models and networks to explore. The next frontiers for social gaming involve both interconnectedness across platforms as well as evolving to a mature stage where the business develops the kinds of enduring franchises that drove the console gaming business. In this first wave of social games, new companies such as



Zynga emerged, and scores of games came and went that looked pretty much the same. But now companies such as

once again. ▲

Classics such as Bejeweled get a new life when Facebook social sharing tools let friends compare high scores.

MTV, ESPN, Google, Yahoo!, and Electronic Arts are taking notice.

"It is a gold rush right now, and we are participating in that," David says. "But the longer-term approach is to take these franchises and put them out there where people can play and connect them all up."

As they say, the game may be poised to change

by Steve Smith

Playdom: Now You Are Playing At Scale

Although Zynga has garnered much of the press attention around social gaming, Playdom (www.playdom.com) has emerged as one of the quieter giants in the market. Recently acquired by Disney, with leading titles such as Social City and Mobster and a new licensing deal with ESPN, the company is now one of the major players. Chief Financial Officer Christa Quarles says the tsunami of users (36 million monthly) who are new to gaming creates a new set of technical challenges.

CPU: Who is playing at social gaming and how much are they playing?

CQ: There is no barrier to entry here. There is no console you need or any applications you need to download. It is very accessible to a lot of people and has opened up the

concept of gaming to many more people. The biggest differentiator [from traditional gaming] is gender. It tends to be more female-oriented. There are many men tending to crops, but the nurturing aspects of current social games means that they cater to women. The best players are over 35 with a lot of time on their hands—Middle American females. There is significant user volume. We will see gamers return to play 15 or 20 times a day.

CPU: This must create a huge technical issue for serving all of this activity.

CQ: The server costs are not trivial. If you think about what we are sending back and forth to players, it is inventory and music and instructions. There are the game specifics (scores, position on a board, etc.). Then

you have to write back to the servers quickly to make sure the action is employed in the game and saved. After that, you have to account for the different browsers involved.

We haven't gone down the path of building a data center, so we have to use a mix of managed hosting partners and a few games using Amazon.com's [cloud services]. From a hardware perspective, we have complex database servers that have to store and manage all that information about the user.

CPU: Technology seems to have become a key differentiator as smaller developers sell out to bigger ones such as Playdom.

CQ: If you are a small developer, then your ability to concurrently touch 10, 20, or 40 million users on a monthly

basis gets harder as you reach outside of that first set of users. You have to account for crappier laptops and bad connections. [We have] frame rate detection on our end. We have to see how quickly our page is being loaded [on the user's end] and then determine how to optimize the experience for them. That's really where we fight on a daily basis, making as rich a user experience as possible. **CPU:** Where does the industry evolve next?

CQ: We are looking forward to other platforms. We have games on iPhone. You can start to see how to embed mobile social elements into gameplay. . . . When you have that social element embedded on top of the mobile construct, we think that is very interesting and will be important. ▲

The Cutting Edge

by Barry Brenesal

The 18th Century Chess Computer That Was A Fraud

In the July issue, I discussed the career of computer and robotics pioneer Leonardo Torres y Quevedo, who invented the first genuine, computerized chess player. True, it only calculated endgames with three specific pieces, but this was in 1914, long before people were supposedly even thinking along these lines. I made casual reference at the time to The Turk, an 18th century mechanized chess player.

Upon reading this, my wife wanted to know more about The Turk. It wasn't real, I pointed out. I'd be devoting a column to something that, in effect, never truly existed.

"So?" she responded. There was no reply possible to that kind of devastating logic. Herewith begins a heavily abbreviated history of The Turk, the chess-playing computer that never was. And it starts, as some hoaxes do, with a scholar who just wanted a career push so he could pursue the work he really enjoyed.

Wolfgang von Kempelen was a brilliant, ambitious civil servant at the Austro-Hungarian court in Vienna with a great interest in mathematics and physics. He lacked opportunity to display his inventive turn of mind, however, and the stratified ranks of court society proved no help. To end his frustration, Kempelen in the late 1760s put all his considerable ingenuity into devising a bold fraud.

This fraud was The Turk. It was advertised as a chess-playing automaton that had a strong if not invincible game. The exotic mannequin dressed in traditional Turkish garb that moved the chess pieces sat attached to a beautiful cabinet. Opening a series of front and back doors would show clockwork contents that led straight through. Concealed was a sliding cushioned seat for an actual human player. This moved from side to side depending upon which doors were open, raising a series of additional dummy gears to provide further authenticity. The extremely thin chessboard permitted magnetized chess pieces to be tracked from within the cabinet. Kempelen even insulated the cabinet from outside magnetic fields, allowing him to occasionally run a large magnet alongside the chess board, just to show the game's progress was not influenced.

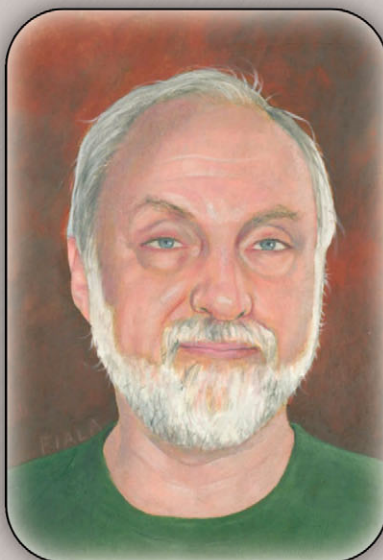
The Turk's Viennese court debut in 1770 was a tremendous success, and achieved

through fakery what Kempelen had long honestly sought: recognition and administrative advancement. Within the next few years, the inventor received a patent for a steam turbine engine, built a pontoon bridge for his hometown of Pozsony, and created a hand-driven printing machine—actually, a proto-typewriter—for the blind pianist, Maria Theresia Paradis. (Mozart in turn wrote a piano concerto for her.) He was also one of a distinguished group that oversaw the reconstruction of

Hungary's famed Buda Castle. But in 1781, Emperor Joseph II ordered Kempelen to reassemble his chess player for a visit by Grand Duke Paul of Russia. That in turn led a reluctant Kempelen into making a European grand tour. In Paris, The Turk played and lost against the celebrated chess player and composer, François-André Danican Philidor, and won against Benjamin Franklin, then the U.S. Ambassador to France. Franklin considered it a hoax but, given his temperament, a delightful one, and followed The Turk's adventures for the rest of his life.

After other sojourns in London and the German States, a nervous Kempelen finally made it back to Vienna. There he sold The Turk and worked instead on his magnum opus, a manually operable machine for reproducing human speech. He eventually exhibited it, and published his findings on experimental phonetics in a 450-plus-page book. Charles Wheatstone created an improved version of Kempelen's machine some 40 years later, which was in turn seen at an exposition by a very young Alexander Graham Bell—whose enthusiasm led first to his own version, and then to the telephone.

Alas, The Turk's fate was less fortunate. Sold to a Bavarian musician and newly equipped with a mysterious voice box, it toured Europe once again, even playing Napoleon, before ending up in the U. S., where it lost a match against one of the signers of the Declaration of Independence. After its owner's death, the chess player was retired to a Philadelphia museum's storage rooms; and when those burnt down in 1854, one of its disheartened fans claimed that The Turk could be heard over the blaze whispering loudly, "Échec, échec!" ▲



Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100.

It was last seen functioning as a boat anchor.

Wax nostalgic with Barry at barry@cpumag.com



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Black Series

ECS ELITEGROUP & P55H-AK MOTHERBOARD

Elite Computer Systems' P55H-AK motherboard is the latest addition to its line of Black Series products. Created specifically for enthusiasts, the P55H-AK comes equipped with Intel's Ibex Peak P55 chipset; an Intel LGA1156 socket that's compatible with Intel Core i7, i5, and i3 processors; and four dual-channel DDR3 DIMM slots. The board offers compatibility with the latest storage technologies thanks to its four USB 3.0 ports, two SATA 6Gbps ports, and two eSATA 6Gbps ports. For added graphics and audio power, ECS gave the P55H-AK three PCI-E x16 2.0 slots and support for 3-way SLI/Crossfire, and supplements the onboard 8-channel Realtek ALC892 HD audio chipset with Creative Lab's X-Fi MBII 3D audio software.

Extreme Overclocking

Motherboards in ECS's Black Series, including the P55H-AK, share several easy-to-use overclocking features that can help users achieve greater performance. For starters, the M.I.B.2 (Motherboard Intelligent Bios) utility integrates every overclocking function on a single BIOS page and offers a straightforward way to adjust options. M.I.B.3 adds to that advanced frequency tuning for the CPU, RAM, or PCI-E bus speeds. These utilities nicely complement ECS's eOC (Easy Over Clock) software, which offers an intuitive interface that lets even novices overclock like pros.

Automatic Updates

ECS's Black Series technologies are synonymous with ease of use. eDLU (Driver Live Update) simplifies driver updates by automatically searching for appropriate drivers and guiding the user through their installation, while eBLU (BIOS Live Update) simplifies BIOS updates and flashing in the same way. Lastly, eJIFFY, a Linux-based interface, can have you browsing the Web and chatting within eight seconds and without actually booting up the computer.

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The P55H-AK and all Black Series motherboards are built with 15µ gold contacts on the CPU socket and each of the memory slot pins, which offers three times the amount of anti-oxidation, temperature resistance, and scrape protection. Black Series products are also constructed with all solid capacitors, which improve energy efficiency up to 50% and lower operating temperatures by as much as 16%. ■

Quality Assurance - ECS motherboards are 100% tested and offers cross-ship options or free pre-paid return label if the product is verified as defective. For more information, contact elite@ecsusa.com.

Software

Tips & Projects

Visit Old Friends In Windows XP Mode

Last month we started exploring how to set up Windows 7's Windows XP Mode for backward compatibility with older programs that may not properly run under the latest iteration of Windows. This month, we continue exploring WinXP Mode with an example and then move on to some other Win7 techniques.

Work With Programs In WinXP Mode

Although many older programs run just fine in Win7, there are some pesky old-timers that simply won't work. VPN clients are a good example. Such a client might run fine in a 32-bit Win7 environment, yet you might not even be able to install it on a 64-bit Win7 system (saying nothing of a 64-bit machine tunneling into a server running 32-bit software). This mishmash of legacy hardware and software is precisely why Microsoft offers the limited but useful WinXP Mode.

In order to use a program under WinXP Mode, you must install it within WinXP Mode. With WinXP Mode open, you install a downloaded file or a file from your optical drive in the usual way. Keep in mind that XP Mode has its own way of storing files within its sets of folders that we found were not visible from Explorer in Win7. In other words, when installing programs and files for use in WinXP Mode, it is best to do these operations in WinXP Mode itself. For instance, when downloading programs from a Web browser, your WinXP Mode session saves them to a special subdirectory. We found all of our downloads in the

C:\Documents And Settings\XPMUser\ directory, but you will only find them if you work from within WinXP Mode. The Desktop subfolder in that area contains the icons and folders on the WinXP Mode Desktop. It is important to keep this folder structure in mind because your WinXP Mode OS automatically stores many of your saved documents and media files into this XPMUser space.

Installing a program from an optical disc generally requires manual navigation. Putting an Autorun disc into an optical drive could bring up an install option in your Win7 OS, leading you to install the program under the wrong OS. If you configured your WinXP Mode to access your optical drives (under Tools/Settings), then you should be able to access the drive via My Computer from within WinXP Mode. Open the drive and activate the Setup or Autorun files from within WinXP Mode to ensure that the programs are installed under this OS.

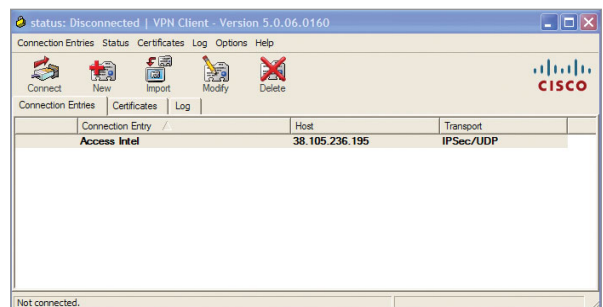
Play The Oldies

When we ran the downloadable executable for the Cisco VPN, the program installed its files in C:\Program Files\Cisco Systems\VPN Client, but they were visible only in WinXP Mode's Windows Explorer. When you install a new program in this fashion, the program

actually becomes available to you in two ways. Within WinXP Mode itself, you access the program from the All Programs menu, where it appears as any program always has in WinXP.

If you need to work with multiple programs in WinXP Mode, then the best approach is to start WinXP Mode and then launch your legacy program from there. For our VPN client, for instance, we needed to have the client connected in its own window while a browser window within WinXP Mode used the VPN to access our partner's content management system.

There is another, easier way of using a program installed under WinXP Mode. A program installed in WinXP Mode shows up in your Win7 programs directory. Look under \Windows Virtual PC\Windows XP Mode Applications. When you open a program from this location, it occupies its own dedicated window without WinXP Mode's Desktop behind it. You can treat it like another open program on your Win7 Desktop: minimize, resize, copy, and paste between apps. The program even appears in



When most programs are installed under XP Mode, they can also be started in dedicated XP Mode windows from the Windows 7 Start menu. They will run just like any other program window in Win7 but will look like an old-style XP window.

the Win7's Taskbar. Although this is handy if you only need to run a single application virtually, the downside of running a legacy program in a dedicated WinXP Mode window is that you can only run one program at a time. If you try to open another instance of WinXP Mode, Win7 warns you that it needs to shut down the open application.

Limits & Possibilities

Gamers should look elsewhere for a solution to running older titles. Microsoft

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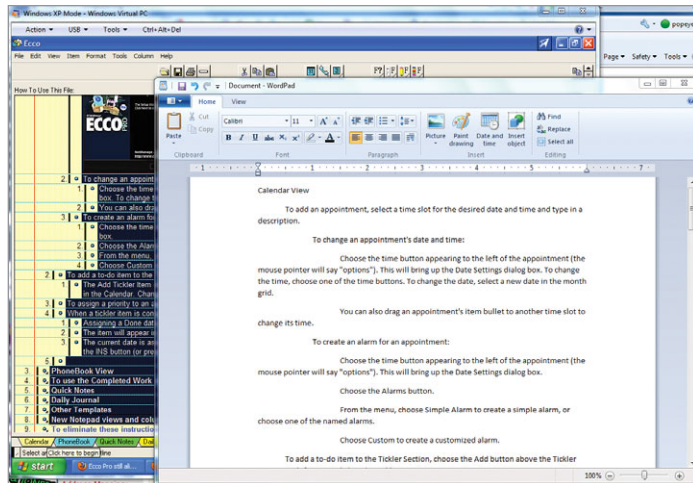


Professionalize any desktop with the Sentry LXE high performance, touch screen external fan controller. Take absolute control of airflow with 5 temperature probes, 5 fan RPM speed controls, and a temperature alarm. Simply place the Sentry LXE on your desk; no need for an open 5.25" quarter bay, no need to reach under your desk.

itself says WinXP Mode was intended for productivity software. XP Mode can access the audio hardware of your PC, but it does not leverage graphics acceleration or much color depth. In our tests, the graphics setting was limited to 16-bit color depth.

So, legacy VPN clients aside, what then is WinXP Mode good for? Actually, it can let you rediscover old standby programs that the 32-bit and 64-bit computing generations left behind. Old PIM (personal information management) software such as Lotus Agenda and Grandview are good examples. In the 1990s, many of us poured tons of notes, contacts, images, etc., into these free-form and text databases that used proprietary file formats.

We ourselves used the tremendous Ecco Pro outliner/PIM, which was discontinued many years ago. Like many other ancient titles that were orphaned by publishers, Ecco Pro is available free online in its original 16-bit version, which will let you access these old files. But



trying to install Ecco Pro in Win7 64-bit returned an error. The same installation file installed under WinXP Mode and was up and running in minutes.

The beauty of being able to run an orphaned program like Ecco Pro in WinXP Mode is that you can access your old files in order to convert them to more current or flexible files (or just to copy and paste material into newer programs). The

The beauty of XP Mode is that you can run an orphaned legacy program in an XPM window and copy its contents into a current program running in your Windows 7 OS.

full copy and paste function-

ality of Windows is accessible here, so you can highlight and capture to the Clipboard full screens of your legacy program in a WinXP Mode window (including graphics) and paste them into a Win7 program window. Or, for die-hard fans of older programs, you can continue to use those old favorites so long as you don't mind devoting all of the memory and system resources that WinXP Mode consumes. ▲

Windows Tip Of The Month

Both Microsoft and independent developers have been busy since Windows 7 launched directing Desktop art and Gadgets, but many people are unaware these options for tweaking the look and feel and functionality of Win7 even exist. Microsoft maintains a Personalization Gallery online (bit.ly/3rW9yS) where you can find fresh new wallpapers, themes, and Gadgets. We found themes for "Avatar" and EA Sports FIFA 2010. There are Desktop and Sidebar Gadgets for everything from quick shut-down to live traffic reports.

Registry Tip Of The Month

By default, Windows 7 saves the search entries you make in the Windows Explorer Search Bar so that they appear as suggestions when you use the query form later. But what if you want to preserve your privacy or if that list of past searches becomes too unwieldy in the drop-down menu of past searches? There are two fixes for this, using the Group Policy Editor or tweaking the Registry.

To turn off the display of recent searches entirely, open the Group Policy Editor by typing **group policy** in the Start Search field and selecting Edit Group Policy. In the Group Policy Editor, navigate to User Configuration\Administrative Templates\Windows Components\Windows Explorer and look for the item Turn Off Display Of Recent Search Entries In The Windows Explorer Search Box. Double-click this to bring up its options box and disable the feature.

If you want to keep the search memory feature enabled but just want to eliminate the recent entries that are showing, use this Registry hack instead. Find the key HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\WordWheelQuery. In the right-hand pane, delete everything except the Default value item. Each value in this pane with a digit for a name ("1," "2," etc.) represents a saved search term. Deleting these numbered entries will eliminate the most recent searches but will leave the feature enabled.

by Steve Smith

Infinite Loop

Hitachi Life Microscope Records Your Laziness . . .

. . . or lack thereof, we suppose. But assuming you're not reading this and simultaneously running a 5K, we assert that your day consists of a measurable level of inertia. Hitachi displayed the intelligent little bangle as part of its 100th anniversary celebration; the Life Microscope slips over your wrist and records, well, your life. And it's smart enough to distinguish between kinetically similar activities, such as eating and working at your desk or sleeping and watching "Cop Out."



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Dragon Slayer is chassis only, components used in picture are for reference only.



Warm Up To Penguins

Linux In A Windows World

As much as any of us may love Linux, the simple fact is that it isn't the dominant desktop operating system. In small niche environments, we may be able to work in a Linux-only setup, but those are few and far between. For the most part, we have to adapt to what other people are using, and the dominant desktop operating system is Windows.

Thankfully, it's pretty easy to access Windows resources, from shared folders to printers, with our Linux boxes. In fact, support for common Windows protocols is so good on Linux that it's possible to make your system act like a Windows box.

In the early 1990s, Microsoft and IBM were jointly developing OS/2. To provide access to shared network resources like files, printers, and other resources, the SMB (Server Message Block) protocol was developed. As time went on, Microsoft expanded the SMB protocol and renamed it CIFS (Common Internet File System).

To provide access to these shared resources, Andrew Tridgell, an Australian PhD student, began reverse-engineering the protocol. By the mid '90s, Tridgell and his team of programmers had successfully implemented the SMB/CIFS protocol for Unix systems. Tridgell and his fellow developers named the project Samba, and the Samba team continues adding features to keep pace with Microsoft's changes. Today, Samba is an invaluable tool for any

Linux or Unix system wanting to use Windows-based resources.

Accessing Windows Resources

The SMB/CIFS protocol is technically a client-server protocol, which simply means that when two computers are sharing a resource, one is asking for access (the client) and one is providing that access (the server). You don't necessarily have to have a powerful machine acting as the server. Suppose you have a small office network environment of two computers, and a printer is hooked up to one of them. The computer the printer is connected to is the server. When the other computer prints to the printer, that computer acts as a client.

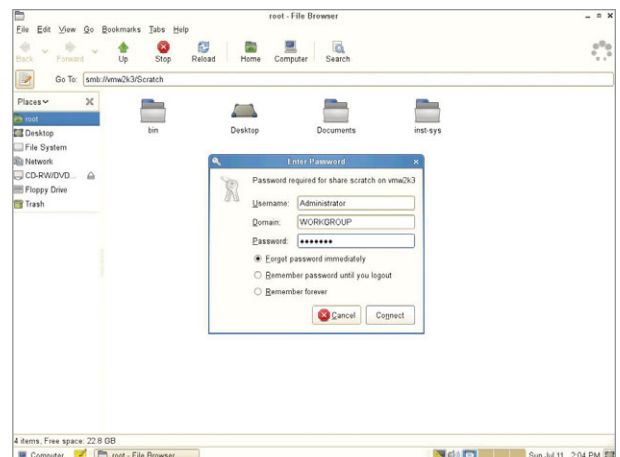
Most Linux distributions will come with at least the Samba client software preinstalled. That means, generally, as soon as you've installed Linux you'll be able to access networked Windows resources. And because Samba's been around for so long, most Linux distributions have integrated it into the other programs. For example, you can use GNOME's Nautilus file browser to access local drives, CD-ROMs, thumb drives, and Windows shared folders all from the

same window. And when you're adding a printer to whatever flavor of Linux you're using, there's generally an option to add a Samba or SMB/CIFS printer.

When you try to access a Windows shared folder or printer, you'll usually be asked for username and password information. After you enter a valid username, password, and Windows domain for that account, the shared Windows resource will be treated like any other network resource. Network folders will appear like a remotely mounted drive, and network printers will show up like other printers.

Sharing Resources

Although accessing Windows resources is pretty easy, sharing Linux resources can be a bit more difficult. One problem is that not all Linux distributions include the Samba server components on a default install. For example, Ubuntu Linux, one of the most popular Linux flavors around, doesn't include the Samba server by default. If you want to share some of your Ubuntu system's resources, you'll have to install the Samba package once the OS is loaded.



You have to specify appropriate Windows login credentials when connecting to a Windows shared folder.

Another reason why sharing Linux resources to Windows systems is a bit more difficult is the authentication required. When accessing a Windows share from a Linux client, you simply enter some login information to access the share. The Windows system knows who you are, and you're good to go. But Samba doesn't use the usual system files to

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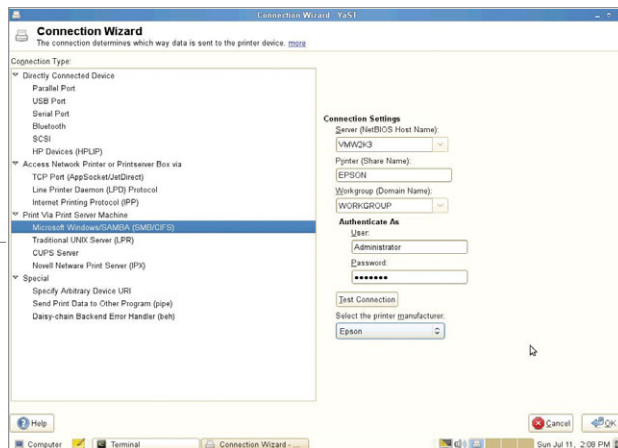
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When adding a Windows network printer to openSUSE, be sure to verify your connectivity.



handle authentication; rather it has its own set of files. The reason for this is because Windows usernames and Linux usernames are not necessarily compatible. It's possible for Windows usernames to have spaces in them, but that's not allowed on Linux.

If you want Windows machines to access your Linux stuff, you'll have to take a couple of extra steps. First, you have to determine which Linux users you want to be able to share their stuff, then create a Samba password for them. To create a Samba password, you have to first log in as root and bring up a terminal window. In that window, type `smbpasswd -a [username]`, where [username] is the Linux username you want to create a Samba password for.

Samba knows what permissions to give a Windows user by using a mapping file. This file essentially tells Samba what Windows username corresponds to which Linux username. So, when the Windows user tries to access a Samba share, it'll automatically give the Windows user the appropriate Unix permissions of the specified user. After you've defined the Samba password, you'll want to edit the `/etc/samba/smbusers` file with your favorite text editor. Every line that begins with a pound sign (#) is a comment, and every other line is simply of the following form:

`[Linux Username] = "[Windows Username]"`

For example, if you have a Linux user named johndoe who also has a Windows login of "John Doe," the line in the `smbusers` file would be:

`johndoe = "John Doe"`

Now, because Ubuntu Linux doesn't let you log in as root, you'll have to preface all Samba-related commands

with `sudo`. You need this because all of the Samba files are system files, and Ubuntu doesn't let you log in as root. The `sudo` command lets you run things as root, without actually logging in as root.

Samba & Large Networks

So far, we've talked about using Samba on networks with a small number of Windows computers. But for networks with lots of Windows machines, Samba can't really be used in the way we've discussed. For large Windows sites, they usually have a Windows Domain Controller, which is basically a set of users and computers that are managed collectively. Users in a Windows domain can log in to any computer also in the domain with a common username and password. And no matter what machine they log into, the user will have access to his home directory and his files.

In a Windows domain, it isn't realistically possible to use Samba the way we've described. It would require creating hundreds, and possibly thousands, of users on each Linux box. Even if someone was willing to create so many users, they'd still need to maintain Samba passwords for each of those users. And then there's the maintenance needed to keep these computers in sync, with their usernames, passwords, and Samba passwords. Doing all of that manually would be a nightmare for anybody.

As it turns out, Samba can work within a Windows domain

environment just fine. In fact, a Samba-enabled Linux system can act just like a Windows machine in every respect. You can configure Samba to make a Linux box act like a client on a Windows domain. Samba will automatically use the Windows username and password information so that you don't need to keep anything in sync. That also means that you can access Windows shared resources faster, because Samba automatically sends the login information for you.

We all love our Linux boxes, but we must also live in a Windows world. And if you want your Linux system to work with Windows computers in a shared network, you're going to need to use Samba. Fortunately, it's more than up to the task of accessing Windows resources, as well as much more. ▲

by John Jung

Infinite Loop

Waterproof Power Strip Can't Be Good On Any Level

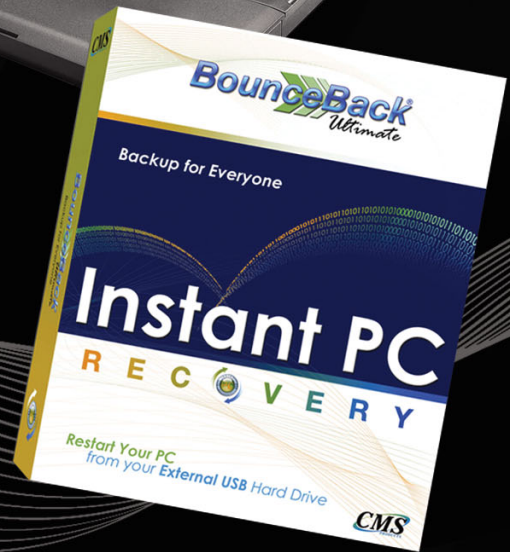
We've watched Wet Circuits' (www.wetcircuits.com) demo videos. We've read over the company's Web site. It all looks and sounds legit, but why are we nonetheless terrified by this power strip? The water-resistant strip can purportedly be hit with a snowstorm and still survive to deliver power to anything that's plugged in. It also protects against sparks, overheating, and shocks related to trying to plug in "not-plug" things. And yet, this is one of those accessories we'll never be reviewing firsthand.



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Shavings From The Rumour Mill

by Mike Magee

No One Understands Microprocessors Anymore

I recently saw a report that claimed Intel was going to kill its Celeron brand next year. Intel has used the Celeron brand since 1998, and it's a very cunning way to divide the market so that there's a CPU available for every level of the market, from the feeblest to the most powerful.

The first Celerons had no cache and not much in the way of raw MHz performance, either—essentially they were cut-down desktop processors aimed to appeal to vendors who wanted to offer machines to people who couldn't afford to lash out on the high-spec microprocessors with cache and better speeds. Underpowered, sure, but they filled a market gap.

As Intel introduced successive generations of its flagship CPUs, it continued to offer Celeron versions and inevitably migrated the Celeron brand to the notebook market, as well.

Intel has a history page about its CPUs which makes interesting reading. In the old days, when the Celeron was first introduced, buying a PC was pretty straightforward: How fast did it go and how much did it cost?

Things are not straightforward now. Even people I talk to on a pretty regular basis at Intel find it hard to explain which processor does what. While there are some geniuses at Intel—chip architects and chip designers—and practically everyone there is very well qualified, it's clear that marketing rules at the chip company. But is it good marketing?

The i3, the i5, and i7 designations, we are reassured by the marketeers, stand for “good,” “better,” and “best.” There is “no such thing” as the i9, which would be better than best. But there are chips coming along better than the i7 because the chip giant is thoroughly caught up in tautology. By branding its CPUs this way it has alienated both its customers (the PC companies and its distributors) and ordinary people like us. People get just as bewitched and bewildered by Intel's naming/numbering schemes as its own employees.

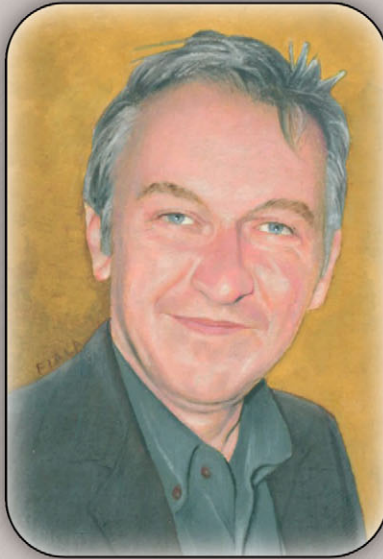
This isn't to say that Intel doesn't make good processors; it clearly does. It's just that trying to understand what a particular machine does and which one to buy is way more complicated now than it ever was because Intel's nomenclature doesn't enlighten, it obfuscates.

Calling a processor an i3, an i5, or an i9 may well be describing it as good, better, or best, but you could equally describe a CPU as cheap, more expensive, and even more expensive. As readers of this magazine know, the truth is that an overall system is affected by many things, only one of which is the performance of a microprocessor. Intel is caught in a trap of its own making. The intricacies of cache size, bus speed, and core technology are lost on the average person.

AMD has made an attempt to address this problem with its Vision scheme, which proposes to help people buying PCs decide what's right for them based on how a PC is used, whether for photography, communications, everyday applications, gaming, or mobile. On the company's Web site, there's a page that takes you through a list of questions, then recommends machines from different vendors that fall into the Vision, Premium Vision, and Ultimate Vision categories. There's also a category called Vision Black for people who want to build their own PCs.

To AMD's credit, it has managed to persuade many vendors to join in the Vision scheme, and VP of Worldwide Marketing Leslie Sobon has explained to me that in these days, your average Joe just doesn't want to be bothered understanding the technical ins and outs of a system. However, my impression is that comparing buying a notebook or a desktop to buying a washing machine doesn't really work. Sure, no one wants to know much about the chips that power your tumble drier, or your fancy car, but it would be helpful to know if the processor in the PC you're buying is any good.

Of course, there's a fly in the ointment of AMD's Vision vision. And that is that although it's a start, and a large number of vendors have got involved in the scheme, there's one very important company that's never going to touch it with a bargepole. And that's Intel, which doesn't seem to know how to market its products now that the days of sheer MHz and GHz are over. ▲



Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. Mike recently started his own Web site, www.techeye.net. He continues to large it up for tgddaily.com, too.

Send rumours to “Mad Mike” Magee at mike@cpumag.com

Technically Speaking

An Interview With Philips' Peter Soares



Peter Soares has been with Philips Lighting North America for 10 years, most recently as consumer marketing director. He has led the development and introduction of several product lines, including the AmbientLED portfolio of consumer replacement bulbs, Energy Saver CFL, and Halogená Energy Saver products.

by Barry Brenesal

CPU: Philips recently announced that it will be releasing an LED alternative to the incandescent light bulb. It is expected to deliver an 80% energy savings, and last 25 times longer. What about the so-called “energy smart” incandescent that offers 10,000 hours of life?

Soares: The LED compares quite favorably. It has a much longer life and much greater energy savings, all while delivering the same color light that people are accustomed to.

CPU: Then how many hours of bulb life are we talking about?

Soares: We peg it at 25,000. Certain components of that are intended to last much longer, but the overall package is expected to last 25,000.

CPU: You touched on the similarity of light spectrum between incandescent and this LED bulb. Incandescent lighting is frequently referred to as warm, in relation to fluorescent, which is characterized as cool. What part of the visible light spectrum is emphasized by LED?

Soares: These LEDs are at a 2,700 degrees Kelvin temperature. If you look at

the color of the typical incandescent light bulb, it's 2,700 to 2,800 degrees Kelvin. It's what most would consider a warm white or soft white color.

Going back over even just this past year, some of the products that came to market had a very bluish color. That's because you can get more light output if the LED is offered in a specific color, such as blue, red, or yellow. It's when you start to harness that, and turn it into white light, a really visible, natural looking white light, that it becomes very challenging. But for the EnduraLED, the color rendering index is about 85, which is considered very good.

CPU: Is this an instance where people seeing the two bulbs side by side will literally not be able to tell the difference?

Soares: Yes, I would expect that you'd be hard-pressed to tell the difference. We've done some informal comparisons, where we've had the same type of table lamp, lit with different types of light sources. More often than not, individuals not only find it impossible to pick out the LED, they usually select the LED as their favorite light source.

CPU: What did they give as the reason for making that choice?

Soares: I think it's the way the light projects—I don't mean directionally, but the color appearance. It still has a soft white color, but perhaps it's not as deep in the yellow as the incandescent. My hunch is that's why people prefer it.

CPU: Was this in focus groups? If not, how did you acquire these responses?

Soares: Not focus groups, but just visitors that we had at our lighting center, while introducing them to the different technologies.

CPU: What about concerns expressed over color variations in LED as viewed from different angles? I know this is an issue generally with many LED devices, due to methods of their deployment. Is this a problem with the bulb?

Soares: It isn't. With this product in particular—the way it's constructed, with the LEDs inside the bulb shell—it uses what we call remote phosphor technology. What that does is take the light from the LEDs and diffuses it, so that the light is dispersed over 360 degrees.

One of the benefits of LEDs is that they work very well as a directional light source. This means that if you put

them in something such as a floodlight or a spotlight, and force that light out from the bulb, it heads in a certain direction and works very efficiently. It gets more challenging when you want to take that LED and disperse the light just like a regular incandescent. It's the way remote phosphor works, that no matter what angle you perceive the bulb from—whether it's below, or from a side—it's always going to look the same.

CPU: Let's discuss environmental impact for a moment. Unlike fluorescent bulbs, LEDs have no mercury. This helps make them more environmentally friendly, but is that true of the LED bulbs in general when looked at alongside fluorescent and incandescent home light sources?

Soares: Its sustainability is a bit different when you're comparing it to each of those other technologies. You're right that LEDs don't have any mercury. Certainly

example, we have several products on the market right now that are floodlights—reflectors, if you will. Those are relatively heavy compared to incandescent and halogen sources, and that's because they have an aluminum shell. At the end of life, there's value in the raw materials that were used in that product. At least it doesn't present the same dilemma as does fluorescent technology at the end of life because with fluorescent, you do have some mercury inside. Even though it's a relatively small amount, it should be recycled, and that mercury harvested safely and properly.

CPU: So are you suggesting that those 60-watt LEDs Philips will be marketing are simply going to be recyclable through standard centers, just as glass and plastic are? No concerns requiring treatment in special facilities?

Soares: Not at this point in time. We don't expect any issues. There are certainly some electronic components inside, and

through the manufacture of LED bulbs. They are RoHS-compliant, which is a European restriction on the use of certain hazardous substances in electrical and electronic equipment. Though this rule was created in the EU, we decided to make all LEDs sold in the U.S. conform to this directive.

CPU: Any tendency toward breakage? Carbon filaments have always been sensitive, although they've gotten much better over the years. CFLs are more secure in that respect, but will there be a certain percentage of these LED bulbs that consumers should expect to fail sooner than advertised?

Soares: We wouldn't think so. The big difference in construction is that a filament lamp is very fragile. A fluorescent has glass. LEDs don't have either; they're solid-state technology, firmly mounted to circuit boards. One quick demonstration that we often do at trade shows or learning sessions is to show

Replacing your incandescent with this LED-based technology
would save you \$120 over the life of the bulb.

—Peter Soares

they don't have any lead. You don't have that same concern of "What should I do with it at the end of its life?" Though Philips certainly advocates that when the product is gone, you should look at local community recycling because it's the right thing to do, and some of the components may be reusable.

CPU: I was going to ask you about that. What you have left when the bulb dies are the remnants of various technologies, some of them different from fluorescent, halogen, and incandescent bulbs. How are LEDs unique from a recycling standpoint?

Soares: With the LED, it depends first on the type of light bulb it is. For

that's why consumers can check with their local recycling authorities to find out if there's something specifically retrievable.

CPU: What about the use of specialized minerals or resources in the manufacture of the bulb itself? I ask that because we recently spoke with a program officer for UNEP, the United Nations Environmental Program. He pointed out that a problem with many computers and mobile phones is the employment of such elements as palladium and cobalt that are very scarce—and increasingly so, given the burgeoning use of these electronic devices in the Third World.

Soares: At this time, we aren't aware of any minerals that could be deleted

that a simple luminescent will burn out with a tap against your hand, since the filament will break, whereas with the LED, you can drop it on the table. Since the design is so rugged, it won't be harmed. From this and other characteristics of the product, I wouldn't expect any early failure concerns.

CPU: How much will the new LED bulb sell for at retail?

Soares: We don't have the definitive price point set for the professional or consumer markets, yet. But the general guide is within the range of \$55 to \$60.

CPU: I suspect many consumers will find that a bit on the high side. Do you

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expect that cost to come down in the next couple of years?

Soares: What we've seen with the technology in general is that the prices have continually declined for these components. The other thing that will help is LED rebate programs. There are upwards of 100 different utility rebate programs in the country right now, encouraging consumers to buy energy-efficient products, such as CFL: Compact Fluorescent Lightbulbs. That's what most of the rebates are focused on, but as soon as the qualified

All those things come together; you're really transitioning from a more disposable to a durable purchase.

CPU: When do you expect the LED bulb to show up?

Soares: It should be on shelves by the end of this year, sometime in the fourth quarter. That product joins about 12, perhaps 14 other LED products that are already in distribution. Those others range from tiny mini-reflectors, to the largest-sized flood bulbs that can be used outdoors in landscape and security

Soares: To get more light output, you need more LEDs. How many LEDs you can pack into that same space determines the light output. The more LEDs you use, the more expensive it becomes, and complicates the total product—because there's only so much room in a very small form factor. Then you have to deal with heat. Despite the bulb being relatively cool to the touch, we have to draw the heat away from the LED and the driver, to insure that it lives a long time. Those things come together to complicate the manufacturing of a 100-watt LED bulb.

To get more light output, you need
more LEDs . . . The more LEDs you use,
the more expensive it becomes,
and complicates the total product.

—Peter Soares

LEDs hit the market, many programs are prepared for them. We believe Philips is the first company to have LED rebates associated with this kind of product. There are two programs in Texas, and there's one in the Philadelphia area right now.

CPU: Still, at that price, you'll probably be pushing energy savings in the long term.

Soares: Absolutely. If you look at the total impact of the product, replacing your incandescent with this LED-based technology would save you \$120 over the life of the bulb. That in itself certainly pays for the product. Then you start to factor in the other benefits, such as not having to purchase 25 incandescent light bulbs over that same time period and reducing the hassle of replacing light bulbs every six months or so when they burn out. There's also a sustainability and environmental aspect: You don't have to put 25 light bulbs into the waste stream over that period.

lighting. All of those are certainly found in many homes across the U.S., but it's the A-shaped bulb that's so associated with table lamps, floor lamps, and ceiling fixtures that's really going to kick up the adoption by the public of LED technology in this field.

CPU: One issue that has prevented this technology from achieving more than niche market status in the past has been achieving sufficient wattage. A large portion of the public still wants 100-, 120-, and 250-watt bulbs. Is Philips working on this?

Soares: We've got a 25-watt on the market now, 60-watts later this year, and the next frontier will be 75-, and then 100-watt bulbs. I don't have a specific timeline on either, because it does get more challenging and more expensive to bring that kind of equivalency into the same shape and format.

CPU: What about this technology makes this expensive and challenging?

CPU: As the same conditions prevailed in moving from 25 watts to 60, how did you manage it then?

Soares: Philips approached it on a global basis. We leveraged the expertise from scientists we had in the Netherlands to create that new remote phosphor technology. Then we used Philips Lumileds in San Jose, who are leading industry experts on LEDs, the drivers, and how you harness the power of each LED. Then we took the expertise of Philips Color Kinetics in Burlington, Mass., who were the experts on the electronics behind the whole product.

CPU: Sounds like a classic instance of synergy.

Soares: It was, and much of what I just described went into producing the bulb that was submitted to the Department of Energy's L-Prize lighting competition, challenging industry to develop the next revolution in lighting. **CPU**

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Q&A With Min-Liang Tan

How Razer's CEO & Chief Gamer Maintains His Competitive Edge

As we were finishing the edits on this interview with Razer's Min-Liang Tan, he posted this on Twitter: "Just failed the test for power boating. Enjoying the novelty of failing while I look for an oar to bash the examiner's brains out." We couldn't think of a better synopsis of this CEO and chief gamer's personality: joking, self-deprecating, introspective, aggressive, and determined to succeed. Tan has already transformed the gaming hardware landscape. Let's dig into the background of this would-be assassin and see where he predicts gaming hardware is headed.

Q What's your background as a gamer? Razer aside, do you have any accomplishments in the field?

MT I've been playing games since the Apple II days and have grown up through the years playing the classics to the latest games today. At one point of time in my life, I was playing Unreal Tournament and Quake competitively. I still play actively, and a good excuse now is that it's "research." With my job, in the course of designing products, we usually get invited to playtest most of the upcoming triple-A titles years before they are launched.

Q Is there an anecdote that stands out in your memory as being particularly telling about your professional path?

MT My grades suffered in a couple of high school classes from playing Doom. I pretty much spent time gaming rather than on homework and studies and eventually got dumped by my girlfriend just so I could spend time gaming. I was one of the top players in my circle of friends back then, but being great at Doom had no hope of any practical application in my life. We founded Razer for the sole reason of getting an unfair advantage while playing. It's as simple as that.

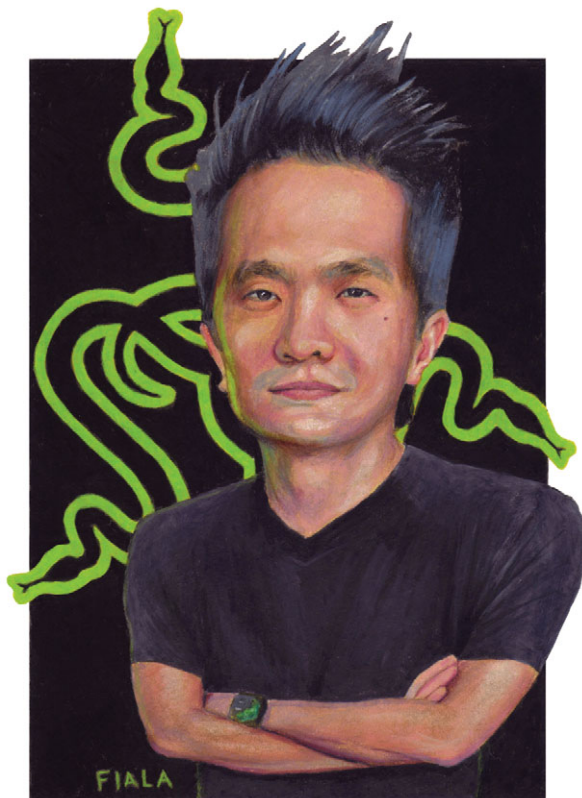
Q Can you describe one or two of Razer's early crisis moments and how you overcame them?

MT One of the biggest crises we faced in the early days was when we were just ramping up production of our first product, the Razer Boomslang. We were already late, we had delayed the launch of the product, and we had maxed out all our resources. To fund production, we had borrowed from friends and family. Production was critical to the success of the company. Then an earthquake struck Taiwan where our manufacturing facilities were located and wiped out our tools and our entire inventory. It destroyed some of the product molds. We were under-funded from day one and couldn't afford to develop new products.

The economy was in the pits then. No one was prepared to extend any funding, so we decided to put things on the back burner. We took on day jobs and slowly, through the course of the next year, funded the company all over again with our salaries.

Q Consoles vs. PCs: Will one emerge victorious for gaming?

MT I don't see it as a choice between one or the other. I play Xbox 360 games, PS3 games, and PC games at the same time. Every platform has great games. Sometimes you may play God of War III, for example, and it's exclusive on PS3. You may play StarCraft II; try playing StarCraft II on an Xbox—you can't, right?



I don't just see PC gaming growing. I see it growing exponentially. I see console gaming growing a lot at the same time. In January, we announced the world's first premium Xbox controller, the Razer Onza, and the first premium headset, the Razer Chimaera. There's been a lot of excitement about bringing the Razer brand to console gaming. We've never said, "for PC gamers, by PC gamers." It's "for gamers, by gamers." Anything that we believe a gamer will dig, we're there. As far as there being a future, I see one for both PCs and consoles.

Q Bejeweled doesn't seem likely to remain the height of cell phone-scale gaming for long. As smartphones quickly close the gap with netbooks, what do you hope to see happen in the world of ultraportable gaming?

MT More compelling content than casual games—hardcore FPS, RTS, or even MMOs on the go. Being able to play console or PC titles on the go would be the Holy Grail. This is perhaps where the innovations of cloud computing coupled with high-speed wireless networks may be the future of gaming. ▲

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